A REVIEW OF THE FLAT-HEADS, GURNARDS, AND OTHER MAIL-CHEEKED FISHES OF THE WATERS OF JAPAN

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BY

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Of Stanford University

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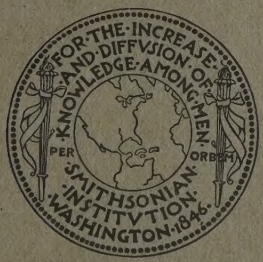

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By David Starr Jordan and Robert Earl Richardson,
Of Stanford University.

In earlier volumes of these Proceedings the Japanese representatives of certain families of Scleroparei, or Mail-cheeked fishes (Scorpænidæ, Hexagrammidæ, Cottidæ, Agonidæ, Liparidæ, and Cyclopteridæ), have been described by Messrs. Jordan and Snyder and by Messrs. Jordan and Starks. In the present paper the remaining families of this group are considered. The specimens examined were collected in 1900 by Professors Jordan and Snyder. Series of these specimens are in the United States National Museum and in the museum of Stanford University. The accompanying illustrations are the work of Mr. William S. Atkinson.

Family PLATYCEPHALIDÆ.

THE FLATHEADS.

Head flattened and more or less armed with spines and serratures, scaly posteriorly; body depressed anteriorly, subcylindrical posteriorly, covered closely everywhere with ctenoid scales; lateral line present; two dorsal fins, the first preceded by a short detached spine; ventrals I, 5, thoracic, inserted wide apart, and well behind pectorals; lower rays of pectorals more or less free at tips; no pectoral appendages; jaws, vomer, and palatines with bands of villiform teeth, some of the teeth sometimes enlarged and more or less canine-like; tongue free at tip; no air bladder; pyloric appendages in moderate number.

Japan and the northwest Pacific, and all Indian, Polynesian, and Australian seas, to the eastern coast of Africa. Species about 40; genera 4. Three genera and 7 species found in the waters of Japan. They are abundant market fishes and in common with the larger

species of *Callionymus*, which they resemble in form, color, and habits, they are known as "Kochi."

KEY TO GENERA.

a. A stout antrorse spine on the lower face of the preopercle; margin of iris entire; no ocular cirri; scales 50; lateral line nearly smooth.....*Rogadius* [a]1

aa. Preopercle without antrorse spine; ocular cirri present and margin of iris fringed in some species; scales 40 to 120.

b. Head more or less strongly armed with spines and serratures; teeth in villiform bands on jaws, vomer, and palatines, the vomerine bands separate, paired, and set lengthwise of the shaft of the bone; scales 40 to 90; lateral line armed or not.....*Thysanophrys* [b]2

c. Ocular cirrus wanting.....*Insidiator*

bb. Head entirely or nearly smooth; vomer with small canine-like teeth, in a crescentic band, set at right angles to the shaft of the bone; palatines with a single most prominent row of canine-like teeth; scales very small, usually more than 100; lateral line smooth.....*Platycephalus* [c]3

1. ROGADIUS Jordan and Richardson, new genus.

Head rather longer and less depressed than in most species of *Insidiator*, and much more so than in *Platycephalus*, well armed with spines and small serratures; a stout antrorse spine on the lower face of the preopercle and 3 spines at the angle, directed backward; cornea without cirri or lappets; scales moderate, about 50 in lateral line, which is smooth except anteriorly; teeth as in *Thysanophrys*.

A single species is found in the seas of China and Japan.

(*rogad*, Arabian name of *Platycephalus indicus*.)

Type of genus.—Rogadius asper.

1. ROGADIUS ASPER (Cuvier and Valenciennes.)

Platycephalus asper CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 257 (Japan).—RICHARDSON, Ichth. China and Japan, 1846, p. 217 (Canton).—TEMMINCK and SCHLEGEL, Faun. Japon., Pisc., 1843, p. 40, pl. XVI, figs. 4 and 5 (after Cuvier and Valenciennes).—GÜNTHER, Cat. Fishes, II, 1860, p. 190 (China).—ISHIKAWA, Cat. Fishes, Imp. Mus. Tokyo, 1897, p. 48 (Kagoshima).

(?) *Platycephalus macrolepis* NYSTRÖM, Svensk, Vet.-Akad. Handl., 1887, p. 13, IV, No. 4, p. 26 (Nagasaki) (not of Bleeker).

Habitat.—Sandy coasts of southern Japan and southern China.

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[a] In addition to the single species (*R. asper*) found in the waters of Japan, *Platycephalus pristiger* Cuvier and Valenciennes and *P. polyodon* Bleeker may be referred to this genus.

[b] In addition to the Japanese species, the following may be regarded as belonging to the genus *Thysanophrys: scaber* Linnæus, *neglectus* Troschel, *detrusus* Jordan and Seale, *malabaricus* Cuvier and Valenciennes, *isacanthus* Cuvier and Valenciennes, *malayanus* Bleeker, *bosschei* Bleeker, *bataviensis* Bleeker, *rodericensis* Cuvier and Valenciennes, *borboniensis* Cuvier and Valenciennes, *bobossok* Bleeker, *sundaicus* Bleeker, *macracanthus* Bleeker, *celebicus* Bleeker, *pristis* Peters, *cirronasus* Richardson, etc.

[c] The following extra Japanese species may be retained in the genus *Platycephalus: P. fuscus* Cuvier and Valenciennes, *tasmanius* Richardson, *lævigatus* Cuvier and Valenciennes, *inops* Jenyns, *grandispinis* Cuvier and Valenciennes, *bassensis* Cuvier and Valenciennes, *proximus* Castelnau, *richardsoni* Castelnau, *castelnaui* Macleay, *cinereus* Günther, *grandis* Castelnau.

Head 2.4 in length without caudal; depth 6.5; depth of head 3 in its length; width of head 1.9; eye 3.6; interorbital space 5 in eye; maxillary 2.5 in head; nose 3.3; D. I–VII—11; A. 11; scales 54; first 2 or 3 scales of lateral line with short spines.

Head rough, angular; superorbital and suborbital ridges finely serrated for their entire length; a stout spine in front of each orbit; top of head with low spines; opercular, scapular, and humeral spines sharp; preopercle furnished posteriorly with 3 spines, the upper spine strong, reaching to the opercular margin; a stout curved spine on the inferior face of the preoperculum, directed forward; opercular membrane under preopercular spines entire; eye without tentacle or cirrose lappet; jaws with broad bands of villiform teeth; vomerine and palatine bands with many of the teeth sharp and longer than the rest, canine-like; tongue convex at tip.

Spinous dorsal slightly lower than soft dorsal, the longest spine 2.75 in head; anal inserted under third ray of soft dorsal; pectorals 2 in head; ventrals 1.75; caudal rounded behind, squarish at upper and lower corners.

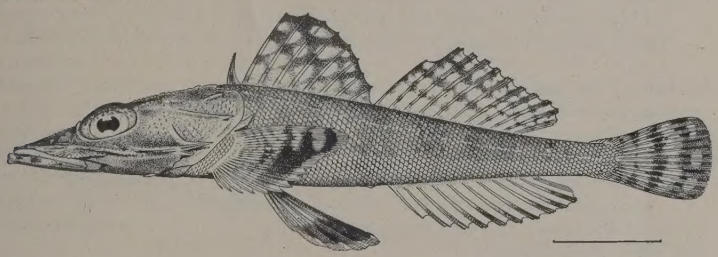

FIG. 1.—ROGADIUS ASPER.

Color in spirits grayish brown, tinged with purplish; back obscurely banded with dusky; spinous dorsal mottled in the membranes; soft dorsal with spots on the rays, forming rows; caudal indefinitely cross-banded and mottled with dusky; upper pectoral rays specked with dusky; lower half of pectorals blackish with an outer whitish edge; ventrals pale toward base, blackish outwardly, with a narrow pale margin; anal pale.

Here described from a single specimen, 5¾ inches long, taken at Swatow, China. It was not found by Jordan and Snyder in Japan.

(*asper*, rough).

2. THYSANOPHRYS Ogilby.

Thysanophrys OGILBY, Proc. Linn. Soc. N. S. W., 1898, XXIII, p. 40 (*cirronasus*).
Insidiator JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 368 (*rudis*=*meerdervoortii*).
Grammoplites FOWLER, Journ. Ac. Nat. Sci. Phila., XII, 1904, p. 550 (*scaber*).

Head broad and much depressed, although less so than in *Platyephalus*, well armed with spines and serratures; angle of preopercle

with 2 or 3 spines, the upper of which is longest; no spine on low face of preopercle; teeth in villiform bands on jaws, vomer, ar palatines, the vomerine bands 2, separate, and set lengthwise of tl shaft of the bone; ocular cirri absent or present; scales large small, 40 to 90 in the lateral line, which is variously smooth or arme partially or for its whole length.

Species numerous, in sandy bays in the East Indian, Chinese, an Japanese seas, five species found in Japan. This genus was orig nally separated from *Platycephalus* by the minor character the ocular cirrus. We are unable to separate from *Thysanophry* the subgenera *Insidiator*, based on the large scales, and *Gramm plites* based on the spinous armature of the lateral line.

(εὔσανος, fringe; ὀφρύς, eyebrow.)

KEY TO THE SPECIES OF THE GENUS THYSANOPHRYS FOUND IN JAPAN.

a. *Insidiator*, scales relatively large, about 40 in the lateral line; a small cirrose lap pet on upper rim of cornea; preopercular spines 3; D. I–VIII–11 or 12.

b. Lateral line armed; ventrals reaching past front of anal; color dark grayish brown the back crossed with about four indefinite broad bars; pectorals specked above their lower half blackish; ventrals pale at base and tip, the middle blackish. *spinosus*,

bb. Lateral line smooth; ventrals not quite to front of anal; color light yellowish brown, with vague dusky bars; pectorals and ventrals specked in the rays. *macrolepis*, 3

aa. Scales smaller, 70 to 90 in lateral line.

c. Preopercular spines 3; scales 75; lateral line smooth; D. I–VIII–11; A. 11; no cirri; color grayish, with small spots of dusky on head and trunk forward caudal crossed by vague broad bars of dusky.....*meerdervoortii*, 4

cc. Preopercular spines 2.

d. Ocular cirri present. (*Thysanophrys*, *Platycephalus longiceps* Cuvier and Valenciennes) *nematophthalmus* Günther, *tentaculatus* Rüppell, *cirronasus* Richardson, etc., of the East Indies.)

dd. Ocular cirri absent.

e. Lateral line armed for its entire length. (*Platycephalus scaber* Linnæus, type of *Grammoplites* Fowler, and other East Indian species.)

ee. Lateral line smooth, or armed only anteriorly.

f. Opercular membrane under preopercular spines with a conspicuous tongue-like flap, behind which is an acute notch; scales 70–80; D. I–VIII–12; A. 12; color, reddish brown, with 6 vague cross bands; no spots; rays of both dorsals and of pectorals speckled, the membranes clear; caudal with numerous small spots .....*japonicus*, 5

ff. Margin of opercular membrane below preopercular spines entire; scales 90; D. I–VII or VIII–11; A. 11; color, dark purplish gray with 4 or 5 broad cross-bands; back, sides; top of head, and muzzle with numerous small black spots; spinous dorsal blackish outward; soft dorsal with rather large spots, extending into the membranes; caudal with a few large spots and band-like splashes.....*crocodilus*, 6

2. THYSANOPHRYS SPINOSUS (Temminck and Schlegel).

ONIGOCHI, Devil Kochi.

Platycephalus spinosus TEMMINCK and SCHLEGEL, Faun. Jap., Pisc., 1843, p. 40, pl. XVI, figs. 1, 2 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 217 (Canton).—BLEEKER, Niewe Nalez. Ichth. Japan, 1857, p. 77 (Nagasaki).—GÜNTHER, Cat. Fishes, II, 1860, p. 190 (Japan).—ISHIKAWA, Cat. Fishes Imp. Mus. Tokyo, 1897, p. 48 (Izu).

Insidiator macrolepis SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 487 (Kagoshima; Yamagawa). (Not *Platycephalus macrolepis* of Bleeker.)

Habitat.—Southern Japan from Suruga Bay to Southern China.

Head, 2.6 or 2.7 in length without caudal; depth, 6.3; depth of head, 2.5; width of head, 1.3; eye, 4 to 4.2; interorbital space, 3 to 3.2 in eye; maxillary, 2.5; nose, 3.5; D. I–VIII–11 or 12; A. 12; scales, 40; scales of anterior third or half of lateral line armed with short but sharp spines.

Head much roughened with spines and serrated ridges; superciliary ridges with about 12 close serratures extending their entire

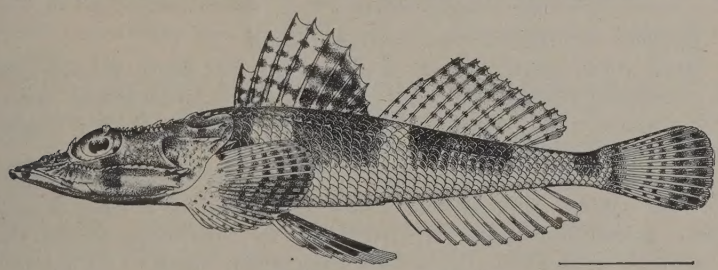

FIG. 2.—THYSANOPHRYS SPINOSUS.

length; a spine and 2 or 3 smaller serratures in front of each orbit; infraorbital ridges serrated closely for their entire length, being interrupted by a slightly deeper notch opposite pupil; post-orbital, parieto-occipital, opercular, scapular, and humeral spines well developed; preopercular spines 3, the upper stout, reaching more than halfway to the opercular margin; a shallow notch in the margin of the opercular membrane under the preopercular spines; a cirrose lappet on cornea above pupil; teeth villiform, in bands on jaws, vomer, and palatines; vomerine bands set lengthwise; no canines; tongue trilobed (emarginate, with a secondary median convexity).

First dorsal somewhat higher than second, the longest spine 2.1 or 2.2 in head; anal inserted slightly behind soft dorsal; soft dorsal and anal margin scarcely notched between the rays; pectorals, 1.8 to 2 in head; ventrals, 1.4; caudal subtruncate, but slightly rounded.

Color in alcohol dark grayish-brown above, the back crossed with 4 to 6 indefinite bands of darker color (there being typically 4 bands,

the middle two of which are broader than the others and show a tendency to split up into narrower bars); belly yellow; soft dorsal and caudal with specks on the rays, forming rows; spinous dorsal with the rays specked and with the membranes clouded with dusky, especially posteriorly; ventrals pale at base and tips, with a blackish band across the middle; upper half of pectorals specked in the rays, the membrane pale; lower half of pectorals blackish; anal pale.

Of this species we have 34 specimens from Nagasaki, 2 to 4½ inches. Here described from two specimens from Nagasaki, 4½ inches long. (*spinosus*, spinous.)

3. THYSANOPHRYS MACROLEPIS (Bleeker.)

ONESAGOCHI, Eldest Kochi.

Platycephalus macrolepis BLEEKER, Niewe Nalez. Ichth. Japan, 1857, p. 76, pl. IV, fig. 1 (not good) (Nagasaki).—GÜNTHER, Cat. Fishes, II, 1860, p. 188.—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV), 1887, p. 260 (Tokyo).

Insidiator hosokawae SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 486, fig. 8 (Urado, island of Shikoku).

Habitat.—Southern Japan, north to Tokyo.

Head, 2.8 in length without caudal; depth 6.5; depth of head, 2.65 in its length; width of head, 1.4; eye, 4.1 or 4.2; interorbital space, 2.6; maxillary, 2.5; nose, 3.3; D. I–VIII–11 or 12; A. 12; scales, 38 to 40; lateral line smooth.

Head less strongly armed than in *T. spinosus;* superciliary ridges serrated behind middle of eye; a short bluntish spine in front of each orbit; infraorbital ridges serrated closely for their whole length, the number of teeth about 12; a deep semicircular notch in the infraorbital ridge under middle of pupil; two opercular spines terminating low, short ridges; two scapular spines, the anterior one highest; post-orbital and parieto-occipital spines low; preopercular spines, 3, the upper reaching more than halfway from the notch under it to the margin of the operculum; lower preopercular spines short, the third often scarcely developed; lower margin of opercular membrane entire; a cirrose lappet on cornea above pupil; jaws, vomer, and palatines with bands of villiform teeth; vomerine bands short, placed lengthwise; no canines; tongue emarginate, with a slight median convexity.

First dorsal slightly higher than second, the longest spine 2.16 in head; anal inserted slightly behind soft dorsal; margin of anal and soft dorsal not noticeably notched between the rays; pectorals, 2.2 in head; ventrals, 1.6; caudal subtruncate, scarcely rounded.

Color in spirits light yellowish brown, the back crossed by 4 or 5 indistinct dusky bars; belly yellowish; dorsals, caudal, pectorals, and ventrals with black specks on the rays, arranged more or less in rows; last membranes of spinous dorsal faintly clouded with dusky; anal pale.

Of this species we have 55 specimens from Nagasaki, 2½ to 4 inches long.

Here described from 2 specimens from Nagasaki, 4 inches long. (*μακρός*, large: *λεπίς*, scale.)

4. THYSANOPHRYS MEERDERVOORTII[a] (Bleeker).

ONAGOCHI (Woman Kochi, MAGOCHI Big-eyed Kochi).

Platycephalus meerdervoortii BLEEKER, Acta Soc. Sci. Indo-Nederl., VIII, 1860, pl. I, fig. 3 (Nagasaki; Yedo).—BLEEKER, Enum. Poiss. Japon., 1879, p. 12 (Nagasaki; Yedo; Tokyo).

Platycephalus rudis GÜNTHER, Shore Fishes, Challenger, 1880, p. 66, pl. XXIX, fig. B (Yokohama).—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's, IV, 1887, p. 260 (Tokyo).

Insidiator rudis JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 368 (Tokyo).

Habitat.—Southern Japan, north to Tokyo.

Head 2.8 in length without caudal; depth 7.75; depth of head 3.25 in its length; width of head 1.5; eye 4.2; interorbital space 3 in eye; maxillary 2.5; D. I–VIII–11; A. 11; scales 75; lateral line smooth.

Head moderately armed; superciliary ridges each with about 6 low and rather closely approximated serratures, in front of and behind each ridge a single higher spine; infraorbital ridges with 5 distant spines, the last one just in front of the base of the long preopercular spine; two smooth ridges on upper part of opercle, each terminating behind in an inconspicuous spine; scapular ridges short, each with two spines; parietooccipital region with a pair of low ridges, each terminating in a moderate spine; post-orbital ridges ill-defined, each with two low spines; preopercular spines 3, the upper more than twice the length of the second, and reaching almost to the gill-opening, third spine about half as long as second; a slight but sharp notch on the opercular membrane, under the second spine; anterior nostril with a short dermal flap; teeth in fine villiform bands on jaws, vomer, and palatines, the vomerine bands short, and disposed lengthwise, scarcely reaching past front of palatines; no canines; tongue emarginate, with a very slight median convexity. No ocular cirrus.

Spinous and soft dorsals of about equal height; longest dorsal spine 2.2 in head; soft dorsal inserted slightly in front of anal; the margin of the fin notched to a depth (measured on ray forming hinder boundary of notch) equal to two-fifths of the diameter of the orbit; pectorals 2 in head, reaching to opposite sixth ray of spinous dorsal;

[a] A nominal point of difference between Bleeker's figure of this fish and Günther's figure of *P. rudis* consists in the absence in the figure of Bleeker of the third (lowest) preopercular spine. In view of the perfect agreement of the figures in all other essential particulars, it appears that the point may be waived with entire safety.

ventrals 1.4, their tips to a vertical from second ray of soft dorsal; caudal rounded posteriorly, with the upper and lower angles rather squarish.

Color (in alcohol) grayish, with black dots on the sides forward and on cheeks and opercles; spinous dorsal clouded with blackish, being darkest behind, especially between the fifth and seventh spines; rays of soft dorsal specked with black; pectorals with the rays specked with black and also with some dusky in the membranes; ventrals blackish except near base and at tips; anal pale; caudal crossed by broad bars of dusky, one near base, a narrower one midway, and a broad one across tip.

Specimens: Wakanoura, 1 specimen, $2\frac{3}{8}$ inches; Shimizu, on Suruga Bay, 1 specimen, $5\frac{3}{4}$ inches.

The above description is from a Suruga specimen, $5\frac{3}{4}$ inches in length.

(Named for J. C. L. Pompe van Meerdervoort).

5. THYSANOPHRYS JAPONICUS (Tilesius).

(?) *Silurus inermis* [a] HOUTTUYN, Verhandl. Haarlem, XX, 1782 (2), p. 450 (Nagasaki).

Platycephalus japonicus TILESIUS, Krusenst. Reise, 1812, pl. LIX, fig. 1 (Nagasaki).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 256 (after Tilesius).—(?) RICHARDSON, Ichth. China and Japan, 1846, p. 217 (Canton).—TEMMINCK and SCHLEGEL, [b] Faun. Japon., Pisc., 1843, p. 40, pl. XVI, fig. 3 (Nagasaki).—BLEEKER, Niewe Nalez. Ichth. Japan, 1857, p. 78 (Nagasaki).—GÜNTHER, Cat. Fishes, II, 1860, p. 181 (China and Japan); Shore Fishes, Challenger, 1880, p. 55 (Hongkong).—MACLEAY, Cat. Austral. Fishes, I, 1881, p. 220 (Port Darwin).—STEINDACHNER [b] and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV), 1887, p. 260 (Tokyo).—SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 486 (Kochi; Kagoshima).

Platycephalus crocodilus JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 368 (Tokyo) (not *P. crocodilus* of Tilesius).—SCHMIDT; Pisc. Mar. Orient., 1904, p. 368 (Fusan, Korea).

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[a] We give here a translation of Houttuyn's description of *Silurus inermis*: No barbels or serrated pectoral spine. Body terete, scaled. Head very flat, with large eyes, close together, as in the Stargazer. Opercle with two fine spines. D. VII 11; P. 20; V. 6; A. 10; C. 13. Caudal fin roundish, black and white spotted, like all the other fins. Body reddish. Jaws without teeth. Length, 6 inches. It seems more probable that Houttuyn may have made a miscount (under) of the dorsal and anal rays than that he would have omitted mention of the spotting, if his specimen had been an *T. crocodilus*. The description of the color fits well *T. japonicus*, and it may be that the species should stand as *Thysanophrys inermis*.

[b] The fullness and accuracy of Doctor Steindachner's description, together with the fact that he had a specimen of *P. japonicus* from Schlegel for comparison, seems to establish beyond serious question the identity of the specimens of Schlegel and Steindachner with *P. japonicus* of Tilesius. Certain essential points of Doctor Steindachner's description follow (in translation): "Dorsal 1/8/12–13; scales 65–70, not 100, as stated by Doctor Günther; * * * a well-developed membranous flap below the preopercular spines; color gray, with obscure bands and blotches; dorsals and pectoral with rows of brown spots."

Habitat.—Southern Japan and China, north to Tokyo.

Head, 2.8 in length without caudal; depth, 7.5 to 9; depth of head, 3.5 in its length; width of head, 1.6; eye, 4.6 to 4.8; interorbital space, 2.5 to 3 in eye; maxillary, 2.5; D. I–VIII–12; A. 12; scales, 70 to 80; lateral line smooth except for the first 3 or 4 scales, which may bear small spines.

Head moderately armed; superciliary ridges each with about 6 low spine-like serratures, all behind middle of eye; a sharp spine in front of and behind each superciliary ridge; infraorbital ridges with two distant spines, one under middle of pupil, the other under back of orbit; an upper short and a median long, smooth ridge on opercles, each ending in a good spine; a short (anterior) and a long (posterior) scapular spine on each side of nape; parieto-occipital ridges low, beginning and ending with a rather low spine; 3 moderate post-orbital spines on each side, without a continuous ridge; preopercular spines 2 (with sometimes a minute third spine), both short, the upper being about twice the length of the lower and contained 3 or

FIG. 3.—THYSANOPHRYS JAPONICUS.

more times in the diameter of orbit; a sharp and deep notch on the edge of the opercular membrane directly under the preopercular spines, the membrane in front of the notch produced in a V-shaped, tongue-like flap, which is as long as the upper preopercular spine; jaws, vomer, and palatines with bands of fine villiform teeth; vomerine bands short, obovate, placed lengthwise and reaching scarcely past front of palatines; no canine teeth; tongue emarginate, sometimes with a very slight median convexity.

Spinous dorsal noticeably higher than soft dorsal fin, the longest spine 2.3 in head and about 1.25 times length of highest ray; anal fin inserted under second ray of soft dorsal; margin of anal and soft dorsal moderately notched to a depth (measured on ray forming hinder boundary of notch) equal to nearly two-fifths of diameter of orbit; pectorals 2 in head; ventrals I.4, reaching a vertical from third soft dorsal ray; caudal rounded.

Color in alcohol, grayish-brown above, the back crossed by 6 obscure and ill-defined bands of darker; head obscurely and finely specked and vermiculated; cheeks below the suborbital ridge crossed transversely by alternating obscure light and dark band-like mark-

ings, which are continued for a short distance underneath; exposed upper edges of mandible finely banded and vermiculated with pale and dusky; under parts yellowish; dorsals and pectorals with the membranes pale, the rays being specked with black, the spots forming rows; caudal with dark spots in the membranes, the anterior ones small and roundish and forming indistinct rows; the spots toward back of fin larger and more or less in the form of elongate lengthwise splashes.

Specimens.—Tokyo, 4 specimens, 7½ to 8 inches; Misaki, 1 specimen, 6 inches; Tsuruga, 1 specimen, 7 inches; Nagasaki, 34 specimens, 4 to 8 inches; Wakanoura, 19 specimens, 4 to 6½ inches.

Here described from 2 specimens, 7½ and 8 inches long, from Tsuruga and Tokyo, respectively.

The species is generally common in the markets of southern Japan.

6. THYSANOPHRYS CROCODILUS (Tilesius).

INÈGOCHI, Rice Kochi.

Platycephalus crocodilus TILESIUS, Krusenstern's Reise, 1812, pl. LIX, fig. 2 (Nagasaki).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 256 (after Tilesius).

Platycephalus punctatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 243 (Hindustan, Voy. Peron).—GÜNTHER, Cat. Fishes, II, 1860, p. 180; Shore Fishes, Challenger, 1880, p. 66 (Inland Sea of Japan). DAY, Fishes India, I, 1878–1888, p. 277, pl. LX, fig. 3 (Indian seas).—NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, No. 4, 1887, p. 25 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV), 1887, p. 259 (Tokyo).—SAUVAGE, Poiss. Madagascar, 1891, p. 307, pl. XXXVI, figs. 5 and 5*a*. ISHIKAWA, Cat. Fishes Imp. Mus. Tokyo, 1897, p. 48 (Suruga).—SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 486 (Yamagawa).—JORDAN and SEALE, Bull. U. S. Fish. Comm., XXVI, 1906, p. 38 (Cavite, Philippine Islands).

Platycephalus guttatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 244 (Japan).—TEMMINCK and SCHLEGEL[a], Faun. Japon., Pisc., 1843, p. 39, pl. XV, fig. 2 (Bay of Nagasaki).—(?) RICHARDSON, Ichth. China, 1846, p. 217 (Canton).—NAMIYE, Class. Cat., 1881, p. 104 (Tokyo).

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[a] In the figure of Temminck and Schlegel the number of dorsal bands is incorrectly represented, being 8 and not 5, as in specimens; and the number of soft dorsal rays is stated in the description to be 12, "and not 10, as said by Cuvier." In all our specimens we find 11 soft dorsal rays, the last one being split fully to the base. Enumerating, on the other hand, the points of agreement between our specimens (one of which is 14 inches long) and both the figure and description of Temminck and Schlegel, we find the following:

(1) General color, grayish to reddish-brown, with purplish tinge.

(2) Distribution of spotting: On back, top of head, interorbital space, muzzle, and under eyes.

(3) Spotting of spinous dorsal: The spots in three obscure series, and extending into the membranes. (The young have the outer half of the fin blackish. Schlegel's specimen was 20 inches long.)

(4) Coloration of soft dorsal.

(5) "Adipose," club-like tips of anal rays.

In all of the points enumerated the present species differs markedly from *T. japonicus*.

Habitat.—Southern Japan to the East Indies north to Tokyo.

Head 3 in length without caudal; depth 9; depth of head 3.5 to 4 in its length; width of head 1.6 or 1.7; eye 4.5 to 5.2; interorbital space 2.5 in eye; maxillary in head 2.5 to 2.7; D. VII or VIII, 11; A. 11; scales 90; lateral line smooth.

Size and arrangement of spines on top of head about as in *T. japonicus;* 5 or 6 superciliary serratures, all behind center of orbit; a sharp spine at the upper anterior corner of each orbit; infraorbital ridge with 3 distant spines, one under back of orbit, one below anterior third of pupil, and a third (not found in *T. japonicus*) nearly opposite posterior nostril, upper part of opercle with two low smooth ridges, each ending in a short blunt spine; scapular ridges each with two spines; parieto-occipital ridges low, with two short spines; 3 post-orbital spines on each side, not connected by a continuous ridge; preopercular spines 2, longer than in *T. japonicus*, the upper contained less than $2\frac{1}{2}$ times in the diameter of the orbit, the lower less than half the length of the upper; opercular membrane not notched nor provided

FIG. 4.—THYSANOPHRYS CROCODILUS.

with a flap under angle of preoperculum; bands of fine villiform teeth; vomerine bands short, as in *T. japonicus;* no canine teeth; tongue emarginate, occasionally with a very slight median convexity.

Highest dorsal spine $1\frac{2}{5}$ times height of longest soft ray; margin of soft dorsal and anal behind middle of fins deeply notched, the fin-membrane joining the anterior edge of the rays about midway of their length; free ends of soft dorsal rays expanded (by branching) and brush-like; anal rays similarly expanded outwardly, and covered with rather thick skin; pectorals 2 to 2.2 in head; ventrals 1.4 to 1.6; caudal margin convexo-truncate.

Color (in alcohol) reddish-brown, tending to purplish, back, sides, back and top of head, muzzle, cheeks, and opercles with numerous small roundish black spots; similar spots between the eyes, below them, and on the upper third of each eye itself; back crossed with 4 or 5 broad bars of dusky, the last three directed obliquely forward, and all subject to fading and disintegration with age; under parts

whitish forward, dusky behind ventrals; spinous dorsal in young specimens with its outer half or third blackish; in adults (specimen 14 inches) the darker color fading and breaking into more or less recognizable black spots, which form indistinct rows, but are not confined to the rays as in *T. japonicus;* soft dorsal with large spots, encroaching on the membrane, and forming, on the posterior half of the fin, 3 rows; membranes of anal blackish, in a broad and long splotch between each two rays, pectorals and ventrals dusky, the upper pectoral rays with the spots forming obscure rows; caudal in young with spots and wide longitudinal band-like splashes of blackish, which break up more or less in old specimens.

The color alone sufficiently distinguishes this species from *I. japonicus.* Other more or less important differences are: The absence in the present species of the tongue-like flap on the opercular membrane; the deeper notching of the margins of the soft dorsal and anal; the longer spines of the preopercle; and the thickened, "adipose" anal rays.

Specimens.—Tokyo, 3 specimens, 6 to 8½ inches; Onomichi, 1 specimen, 4½ inches; Hiroshima, 1 specimen, 7 inches; Nagasaki, 2 specimens, 9 inches and one 14 inches; Wakanoura, 4 specimens, 7 to 8½ inches.

Here described from measurements made on a specimen 8 inches long from Wakanoura and one 14 inches long from Nagasaki.

It is common in southern Japan, and southward to India and the Philippines.

(*crocodilus*, crocodile.)

3. PLATYCEPHALUS Bloch.

Platycephalus Bloch, Ichth., XII, 1795, p. 90 (*spathula=insidiator=indicus*).
Calliomorus Lacépède, Hist. Poiss., II, 1800, p. 343 (*indicus*).
Neoplatycephalus Castelnau, Proc. Zool. Soc. Victoria, I, 1872, p. 87, (*grandis*).

Head broad and extremely depressed, being smooth or scarcely armed; angle of preopercle with 2 spines, subequal, or the lower one longest; lower face of preopercle without spine; vomer with small canine-like teeth, in a crescentic band, which is placed at right angles to the shaft of the bone; palatines with a single most prominent row of canine-like teeth, teeth in jaws in broad villiform bands; no ocular cirri; scales very small, more than 100 in typical species; lateral line smooth.

East Indies, Chinese and Japanese seas, Red Sea, Cape of Good Hope, and Australia. Species less numerous than those of *Thysanophrys;* a single one is known from Japan, the center of distribution of the genus being apparently Australia.

(πλατύς, flat; κεφαλή, head.)

7. PLATYCEPHALUS INDICUS (Linnæus.)

KOCHI, MAKOCHI (True Kochi), GINGOCHI (Silver Kochi).

Callionymus indicus LINNÆUS, Syst. Nat., 10th ed., 1758, p. 250; 12th ed., 1766, p. 434; ("habitat in Asia").

Calliomorus indicus LACÉPÈDE Hist. Poiss., II, 1800, p. 343.

Platycephalus spathula BLOCH, Ichth., XII, 1795, p. 90, pl. CCCCXXIV (Tranquebar).

Cottus insidiator FORSKÅL, Descr. Animal., Pisc., 1775, p. X (Red Sea).

Cottus rogad; insidiator FORSKÅL, Descr. Animal., Pisc., p. 25.

Platycephalus insidiator, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 227 (Pondicherry; Moluccas).—TEMMINCK and SCHLEGEL, Faun. Jap., Pisc., 1843, p. 39, pl. XV, fig. 1 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 216 (Canton).—GÜNTHER, Cat. Fishes, II, 1860, p. 177 (China; Japan; India; Red Sea; Cape of Good Hope; N. W. Australia).—Shore Fishes, Challenger, 1880, p. 66 (Yokohama Bay).—NAMIYE, Class. Cat., 1881, p. 104 (Tokyo).—DAY, Fishes India, 1878–1888, p. 276.—NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, 1887, No. 4, p. 25 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV) 1887, p. 259 (Tokyo; Kochi; Kagoshima).

(?) *Platycephalus angustus* STEINDACHNER, Sitzber. Ak. Wiss. Wien., LIII, 1866, p. 213, pl. I, fig. 4 (Surinam, error in locality).

Platycephalus indicus BLEEKER, Atlas, IX, 1878, Platyc., pl. I, fig. 3.—SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 486 (Kagoshima).

Habitat.—East Indies to India and the Red Sea, and north to Japan.

Head 3.2 to 3.4 in length without caudal; depth 9 to 10; depth of head 3.7 to 4 in its length; width of head 1.5; eye 7 to 9; interorbital space twice diameter of eye, maxillary 2.6 in head, D. I–VII–13; A. 13; scales about 120, lateral line entirely smooth.

Head smooth, except for the low superciliary, parieto-occipital, scapular and preopercular ridges, none of which is provided with any spines or serratures; a low blunt spine with a broad base in front of the upper anterior orbital angle; preoperculum ending in two robust spines, of almost equal length, both slightly upturned, and the lower one reaching about half way to the margin of the opercle; a tongue-like flap on the opercular membrane under the preopercular spines; vomerine teeth canine-like, the bands bearing them semicrescentic in form and set nearly transversely to the vomerine shaft; palatines with a single most prominent row of canine-like teeth; jaws with villiform teeth in broad bands; tongue as a rule convex in front, sometimes (in large specimen) showing a very slight emargination.

Highest dorsal spine scarcely equal to longest soft ray; posterior margin of soft dorsal and anal cleft deeply between the rays, the membrane joining the front edge of the rays below their middle; free ends of the rays well branched; pectorals 2 in head in young (2.4 in a specimen 14½ inches long); ventrals 1.5 to 1.7; caudal subtruncate posteriorly.

Color in spirits brownish, with 8 or 9 obscure dusky, cloud-like bands over back; back and top of head and muzzle everywhere vaguely

mottled in fine pattern, the spots on the head of a more or less roundish form and encircled with a ring of pale; bars and mottlings tending to become obsolete in old specimens; underparts yellowish; fins, except caudal, with rows of dusky spots on the rays; caudal with a median longitudinal black band, above and below which are two oblique ones, the upper band being shorter than the other two.

Specimens.—Nagasaki, 2 specimens, 7 to 8 inches; Wakanoura, 3 specimens, 9 to 10½ inches; Tsuruga, 2 specimens, 8½ inches; Tokyo and Misaki, 5 specimens, 8 to 9 inches. It was also seen at Tsuruga, Kobe, Hiroshima, and Onomichi.

Here described from measurements made on a specimen 10 inches long from Wakanoura and one 14½ inches long from Hongkong, China. This species is a common market fish from Tokyo southward, the largest member of the family in Japan, and by far the most abundant. It is known at once by the flat, smooth head, and by the coloration of the caudal fin.

(*indicus*, Indian.)

Family BEMBRIDÆ.[a]

Head not greatly depressed, armed and scaly on the sides; body covered with scales of large or rather small size; a lateral line; 2 dorsal fins, the first with 6 to 11 spines; ventrals thoracic, but inserted a little before the pectorals, I, 5; no pectoral appendages; villiform teeth in the jaws, on the vomer, and on palatines; branchiostegals 7; no air-bladder.

Waters of Hawaii[b] and Japan. Four genera and 4 species, 3 of these inhabiting waters of Japan.

KEY TO GENERA.

a. Anal fin long, of 14 or 15 rays.
  b. First dorsal of 11 spines; top of head with spines and ridges; lateral line traversing middle of side; jaws subequal; scales 55.....*Bembras*, 4
  bb. First dorsal of 6 spines; top of head smooth; lateral line (not described); lower jaw projecting (as in *Parabembras*); scales 40.....*Bambradon*, 5
aa. Anal fin short, of 8 rays, lateral line above middle of side, running parallel with the back; lower jaw projecting, scales about 47 (figure).....*Parabembras*, 6

4. BEMBRAS Cuvier and Valenciennes.

Bembras Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 282 (*japonicus*).

Dorsal spines XI; anal fin long, of 14 or 15 rays; lateral line traversing middle of side; top of head with spines and ridges. Characters otherwise those of the family.

A single species, from Japan.

(βεμβράς, a grasshopper.)

[a] According to Prof. Henry R. Fairclough, of Stanford University, it is good usage in Latin to omit one *d* in patronymics in which two *d*'s occur together, in the interest of euphony. Thus *Liparidæ* should be preferred to *Liparididæ*.

[b] *Bembradium roseum* Gilbert; D. IX–12; A. 11; scales 28; lateral line near middle of body; lower jaw included. Hawaii.

8. BEMBRAS JAPONICUS Cuvier and Valenciennes.

Bembras japonicus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 282, pl. LXXXIII (Japan, Coll. Langsdorf).—TEMMINCK and SCHLEGEL, Faun. Japon., Pisc., 1843, p. 41, pl. XVI, fig. 8 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 217.—GÜNTHER, Cat. Fishes, II, 1860, p. 191 (Japan, stuffed specimen).—BLEEKER, Enum. Poiss. Japon., 1879, p. 12 (Nagasaki).—ISHIKAWA, Cat. Fishes Imp. Mus., Tokyo, 1897, p. 48 (Boshu).—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV), 1887, p. 261 (Tokyô Bay).—SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 488 (Susaki; Urado; Kochi).

Habitat.—South Japan and north to Tokyo.

Head 3.5 in length; D. VI–12; A. 14; scales 55; muzzle longer than eye; jaws subequal; infraorbital ridge with 4 denticulations, directed backward.

Color clear red, more or less mottled or spotted; the dorsal fins with greenish spots.

We have no specimens of this rare species. The above description is condensed from the accounts of Schlegel and Cuvier. The senior writer has, however, examined a specimen from Boshu in the Imperial Museum at Tokyo. It was brick red with distinct spots, D. X–12, A. 14.

(*japonicus*, Japanese.)

5. BAMBRADON Jordan and Richardson, new genus.

Dorsal spines VI; anal rays 14 or 15; lateral line probably traversing middle[a] of side, as in *Bembras* and *Bembradium*, with which this genus is apparently more closely allied than with *Parabembras;* top of head smooth, without spines or ridges.

A single species, from the waters of Japan.

(*βαμβραδών*, a grasshopper.)

Type of genus.—Bambradon lævis.

9. BAMBRADON LÆVIS (Nyström.)

Bembras lævis NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, 1887, No. 4, p. 26 (Nagasaki).

Upper part of head wholly without spines and ridges; body slenderer than in *Bembras japonicus;* breadth behind head somewhat greater than the depth; D. VI–14; A. 15; P. 23; scales 40; eye 4 in head; snout 3 in head; lower jaw projecting considerably beyond upper; second dorsal spine longest, somewhat longer than body's depth; anal slightly longer than soft dorsal; scales thin, ctenoid.

Color brownish, with a row of dusky spots along body's lower edge; under parts dirty white; a black blotch at front of spinous dorsal; anal pale, with a dusky band at base; pectorals brownish, without spots or bands.

[a] Direction of lateral line not stated by Nyström.

This species has not been taken since originally described by Nyström in 1887. The above description is condensed from the original description by Nyström.

(*lævis*, smooth.)

6. PARABEMBRAS Bleeker.

Parabembras BLEEKER, Versl. Ak. Amst. (2), VIII, 1874, p. 370 (*curtus*).

Lateral line high, parallel with the back; anal fin short, of 2 spines and 6 rays (figure of *P. curtus* Temminck and Schlegel); lower jaw strongly projecting.

A single species, known only from Japan.

(*παρά*, near *bembras*.)

10. PARABEMBRAS CURTUS (Temminck and Schlegel).

Bembras curtus TEMMINCK and SCHLEGEL, Faun. Japon., Pisc., 1843, p. 42, pl. XVI, figs. 6, 7 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 217 (after Schlegel).—GÜNTHER, Cat. Fishes, II, 1860, p. 191 (after Schlegel).
Parabembras curtus BLEEKER, Versl. Ak. Amst. (2), VIII, 1874, p. 370.

Habitat.—Island of Kiusiu.

Head, 2 in length of trunk (figure of Temminck and Schlegel); depth 6; D. IX–9; A. 8; P. 21; scales about 47 (figure); muzzle short (shorter than eye in fig.); lower jaw projecting; opercular and subopercular spines feeble; teeth much finer than in *Bembras japonicus;* infraorbital ridge with 3 denticulations.

Color uniform reddish in the dried specimen.

This species appears not to have been taken since it was originally described by Temminck and Schlegel in 1843 from a dried specimen.

(*curtus*, short.)

Family HOPLICHTHYIDÆ.

Head broad and flattened, strongly armed, with upper surface and sides bony; back and sides covered with bony plates; belly and breast naked; two dorsal fins; ventrals I, 5 set at a moderate distance apart, as in *Triglidæ*, but somewhat in front of pectorals; 3 detached pectoral rays, as in *Triglidæ;* jaws, vomer, and palatines with minute teeth; no air-bladder; pseudobranchiæ present.

Japanese and Hawaiian seas; a single genus known, with four species, two of which belong to Japan.

The affinities of these fishes seem to be with the *Triglidæ* rather than the *Platycephalidæ*.

7. HOPLICHTHYS Cuvier and Valenciennes.

Hoplichthys CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, table of contents (*langsdorfii*).
Oplichthys CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 266 (*langsdorfii*).

Characters those of the family. Two species known from Japan. (ὅπλον, armature; ἰχθύς, fish.)

KEY TO SPECIES.

a Anal rays 16; longest pectoral appendage reaching tip of pectoral; a tuft of strong spines on the under side of the head at the outer posterior angle of each mandible; lateral facial edges rather strongly lobed and furnished with strong curved spines; color light grayish brown, the back with 4 obscure crossbars.....*langsdorfii*, 11

aa Anal rays 17 or 18; longest pectoral appendage one eye-width short of tip of pectoral; no spines on under side of head; lateral facial edges scarcely lobed, rather weakly serrated except posteriorly; color grayish, the back crossed by 4 dusky crossbars.....*gilberti*, 12

11. HOPLICHTHYS LANGSDORFII Cuvier and Valenciennes.

Oplichthys langsdorfii CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 264, pl. LXXXI (Japan). (*Hoplichthys* in table of contents; not *Hoplichthys langsdorfii* Temminck and Schlegel.)[a]—(?)[b] SMITH and POPE, Proc. U .S. Nat. Mus., XXXI, 1906, p. 487 (Urado; Kagoshima).

Hoplichthys langsdorfii GÜNTHER, Cat. Fishes, II, 1860, p. 191 (China, Japan).—(?) ISHIKAWA, Cat. Fishes Imp. Mus. Tokyo, 1897, p. 48 (Boshu; Tosa).

Hoplichthys langsdorfii (?) NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, 1887, No. 4, p. 25 (Nagasaki).—(?) STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV), 1887, p. 261 (Tokyo Bay).

Hoplichthys pusillus (?) BLEEKER, Enum. Poiss. Japon., 1879, p. 13 (Nagasaki), (after *Aspidophorus pusillus* Langsdorff, mss.).

Habitat.—Seas of Japan, north to Tokyo.

Head, 3.7 in length to base of caudal; depth, 12.5, depth of head, 3.75 in its length; width of head, 1.3; eye, 3.6; interorbitalspace, 4.2 in eye; maxillary, 3 in head; nose, 3.6; D. VI–15; A. 16; lateral scutes, 28.

Body without scales or plates except for an upper dorso-lateral row of keeled scutes on each side, the dorsal wings of which overlap antero-posteriorly and extend inward nearly to the base of the dorsal rays, forming an almost complete coat of mail for the back; the keel of each scute terminating behind in a sharp, backwardly-directed spine, below which, on the free hinder margin of the scute, is a very small obscure spine; head roughened with a few short spines and many low serrated ridges; free lateral margins of preorbitals, suborbitals, and preopercles, forming a thin edge, which is notched into lobes bearing long, sharp, spine-like serratures; a noticeably broad, shallow notch in the suborbital edge under the front of the pupil, bounded by 2 curved spines, pointing toward each other; angle of preoperculum with 2 long curved spines, the inner and posterior one

[a] For a discussion of the identity of the specimen of Temminck and Schlegel see the conclusion of the present description.

[b] The synonyms in this list which are preceded by an interrogation point are unaccompanied by any descriptive matter, and may not refer to *Hoplichthys langsdorfii* uvier and Valenciennes. See conclusion of present description.

twice as long as the outer and reaching to the base of the pectoral fin; a tuft of small curved spines on the under side of the head at each outer posterior angle of the mandibula; teeth in villiform bands on jaws, vomer, and palatines; tip of tongue convex.

Spinous dorsal (in male ?) relatively high, the fin when depressed reaching to the second ray of the soft dorsal; longest dorsal spine 1.6 in head; soft dorsal highest posteriorly, without filamentous rays, its longest ray 1.3 in head; soft dorsal and anal nearly opposite, both very long, the anal base being nearly twice head; pectoral, 1.4 in head; 3 detached pectoral rays, the longest extending fully to tip of pectorals, 1.3 in head; ventrals, 1.8; caudal rounded.

Color in spirits yellowish brown, the back crossed with 4 obscure cross-bars of dusky, and with many fine punctulations in small, vaguely outlined clusters; belly pale; spinous dorsal with obscure spots of dusky, forming rows across both rays and membranes; soft

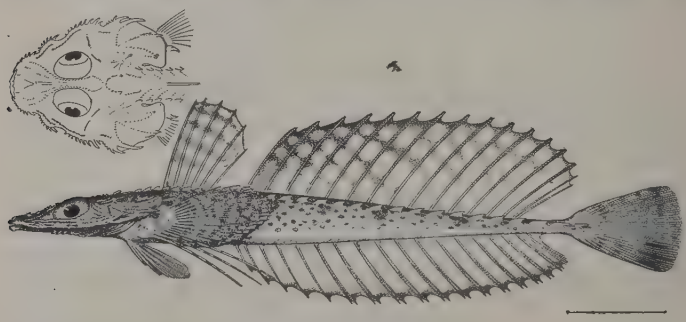

FIG. 5.—HOPLICHTHYS LANGSDORFII.

dorsal mottled, the light color in roundish spots between the rays; caudal and pectorals with the rays specked and with the membranes clouded with dusky; anal pale except for a narrow outer edging of blackish.

This species differs from *Hoplichthys gilberti* and from *Hoplichthys citrinus* Gilbert in having fewer (only 16) rays in the anal fin, in its much longer pectoral appendages, and in the presence of a tuft of spines on the under side of the head at the outer posterior edge of each mandible. The representation of two well-developed spines at the angle of each lateral scute in the figure of Cuvier and Valenciennes is doubtless fallacious, the figure correctly showing, however, practically all of the remaining essential features of Cuvier's description and of our own specimen, including the tuft of spines under each jaw. The fins of Cuvier's specimen were damaged and no certain value can be attached to the rendering of their form. The number of anal rays,

figured as 17, but stated by Cuvier to be 16, is likewise 16 in our specimen, and was found by Doctor Günther to be 16 in several specimens from China and Japan. The larger number of anal rays in Schlegel's specimens, stated in the description to be 17 or 18, and the much lower spinous dorsal and shorter pectoral appendages, as shown in the figure, make it almost certain that it represents a species distinct from *H. langsdorfii* Cuvier and Valenciennes, and probably identical with *Hoplichthys gilberti*, next described.

Here described from a single specimen 5¾ inches long, obtained at Kagoshima and presented to Stanford University by Professor Mitsukuri.

(Named for M. Langsdorf, who brought the first specimens from Japan.)

12. HOPLICHTHYS GILBERTI Jordan and Richardson, new species.

Hoplichthys langsdorfii TEMMINCK and SCHLEGEL, Faun. Jap. Pisc., 1845, p. 156, pl. LXXIX, fig. 2 (not *Hoplichthys langsdorfii* Cuvier and Valenciennes) (Nagasaki).—GILBERT, Bull. U. S. Fish Comm., XXIII, 1903, Pt. 2, p. 641 (Suruga Bay, off Ose Point).

Hoplichthys langsdorfi JORDAN and STARKS, Bull. U. S. Fish Comm., XXII, 1902, p. 593 (Suruga Bay, off Ose Point).

Habitat.—Seas of Japan, north to Suruga Bay, in deep water.

Head 3.4 in length to base of caudal; depth 13; depth of head 3.6 in its length; width of head 1.3; eye 3.6; interorbital space 4 in eye; maxillary 3.2 in head; nose 3.3, longer than eye; D. VI–15; A. 17; scutes 27.

Back and sides with an incomplete coat of mail formed of two rows of keeled scutes, as in *Hoplichthys langsdorfii;* each keel ending in a strong spine, below which is a small concealed one, as in that species; top of head with low serrated ridges; lateral facial edge less spinous than in *Hoplichthys langsdorfii*, and with much less distinct lobes, the notch under pupil scarcely noticeable, being nearly continuous with the weakly serrated edge in front of and immediately behind it; angle of preoperculum with 2 long curved spines, as in *Hoplichthys langsdorfii;* spines on under side of head rather weaker than in *Hoplichthys langsdorfii;* villiform teeth in bands on jaws, vomer, and palatines; tip of tongue slightly emarginate.

Spinous dorsal (in female) low, its longest spine 3 in head, the depressed fin falling well short of the second fin; soft dorsal long and low, without filamentous rays, its longest ray (anterior) 2.2 in head; soft dorsal and anal about opposite; pectoral 1.4 in head, the 3 detached pectoral rays much shorter than in *Hoplichthys langsdorfii*, the longest 1.7 in head, failing of reaching tip of pectoral by a distance nearly equal to diameter of eye; ventrals rather short 2.25 in head; caudal slightly emarginate.

Color in spirits grayish, with dark specks and small clusters of punctulations; back with 4 dusky cross bands; belly whitish; spinous dorsal dusky in the membranes posteriorly, the tips of the rays whitish; rays of soft dorsal specked at broad intervals with dusky; caudal rays specked outwardly, the base of the fin with a diffuse blotch of dusky; latter third of anal with a subedging of dusky, in the membrane; pectorals specked in both rays and membranes.

(Named for Dr. Charles Henry Gilbert, of Stanford University.)

This species differs from *Hoplichthys langsdorfii* in its greater number of anal rays, shorter pectoral appendages, shorter ventrals, longer nose, less lobed and less spinous lateral facial profile. The figure of *Hoplichthys langsdorfii* in Temminck and Schlegel, which is evidently inaccurate in several particulars, whether it be intended to represent *H. langsdorfii* or the present species, may with some reservation be referred to *H. gilberti*, with which it agrees in the short pectoral appendages and in the larger number of anal rays. The fact that those

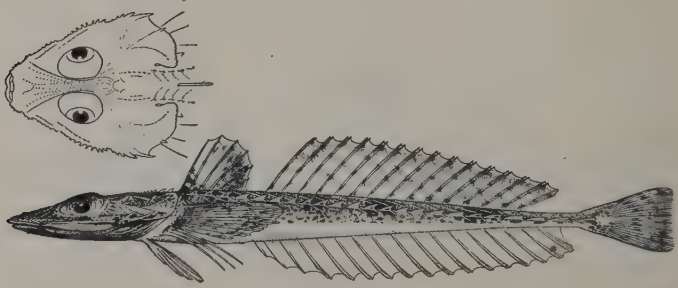

FIG. 6.—HOPLICHTHYS GILBERTI.

authors say in their description that their specimen had 17 or 18 anal rays would alone seem to leave little question that they were at least not the same as *Hoplichthys langsdorfii* Cuvier and Valenciennes.

Hoplichthys citrinus Gilbert, recently described from Hawaii, is close to the present species, differing from it chiefly in the more marked lobing and spination of the lateral facial edges, and in the yet shorter pectoral appendages, the longest of which is contained 2.2 in head (female).

Known and here described from 9 specimens, 3 to 6.50 inches long, taken by the United States Bureau of Fisheries steamer *Albatross* in 75 to 100 fathoms off Ose Point, Suruga Bay, in 1900, and one specimen 5.25 inches long from station 5070, Suruga Bay, in 1906, *Albatross* expedition of 1906, in 108 fathoms.

Type.—The last-named, Cat. No. 51271 U.S.N.M., is the type of the species. The figure is taken from it.

Family TRIGLIDÆ.

THE GURNARDS.

Body elongate, usually more or less fusiform, covered with scales or bony plates; head externally bony, entirely cuirassed with rough, bony plates, some of which are armed with spines; eyes high; mouth terminal or subinferior; premaxillaries protractile; maxillary without supplemental bone, slipping under the preorbital; teeth very small, in bands in the jaws, and usually on vomer and palatines; gills 4, a large slit behind the fourth; pseudobranchiæ present; gill rakers various; gill membranes free from the isthmus; ventral fins thoracic, wide apart, separated by a flat area, their rays I, 5; spinous dorsal present, short; soft dorsal similar to the anal, which is without spines; caudal narrow, few-rayed; pectoral large, with broad base, with 3 lower rays detached, forming feelers, which are used chiefly in the search for food, in turning over stones, exploring shells, etc.; air bladder present; pyloric cæca usually present, few in number. Singular looking fishes, found in all warm seas. Species about 40, some of them in rather deep water, these red in color, the others living about rocks; 3 genera and 7 species known from the waters of Japan.

KEY TO THE GENERA OF JAPANESE TRIGLIDÆ.

a. Lateral line unarmed; no teeth on palatines.
  b. Scales relatively large, about 50 to 65 in number: a row of spinous bucklers along base of dorsal.....*Lepidotrigla*, 8
  bb. Scales relatively small, more than 100 in the lateral line.
    c. Base of both dorsals with a series of shields, each ending in a sharp spine directed backward; opercular spine small; soft dorsal and anal long; dorsal rays IX–16; anal 15: no anal spine.....*Chelidonichthys*, 9
    cc. Back with blunt shields along base of spinous dorsal only; base of soft dorsal unarmed; opercular spine very long; soft dorsal and anal short; dorsal rays VIII–10; anal 11; anal spine distinct.....*Otohime*, 10

8. LEPIDOTRIGLA Günther.

Lepidotrigla GÜNTHER, Cat. Fishes, II, 1860, p. 196 (*aspera=cavillone*).

Scales moderate, about 45 to 55 in number, being much larger than in *Chelidonichthys;* teeth on vomer; no teeth on palatines; a row of spinous bucklers along base of dorsal fin; characters otherwise those of the family.

East Indies, South Seas, and Japanese and Chinese seas; 5 species known from the waters of Japan.

(λεπίς, scale; τρίγλα, *Trigla*, classical name for *Mullus barbatus*, the name *Trigla* transferred to these fishes, for no evident reason.)

KEY TO SPECIES.

a. Pectorals short, not reaching middle of dorsal.
  b. Nasal prominences long, pointed, and divergent, the distance between them at tips usually more than 1½ times interorbital distance; dorsal IX–16 or 17; anal 16; scales 63; no dorsal blotch.....*alata*, 13

bb. Nasal prominences less developed, pointed or not, the notch between them shallow and the distance between their outer tips little more than the interorbital distance, if any.

c. Upper detached pectoral ray falling short of tip of ventral by a distance about equal to diameter of eye; dorsal VIII or IX–15 to 17; anal 15 to 17; scales more than 60; a dark blotch between fourth and seventh spines of dorsal fin ..... *microptera*, 14

cc. Upper detached pectoral ray reaching almost or quite to tip of ventral; spinous dorsal without a dark blotch.

d. Second dorsal spine much elongated, its length 1¼ times that of third spine, and its anterior edge strongly serrate nearly to tip; dorsal VII–16; anal 16; scales 61; spinous dorsal without permanent blotch; though there may be some specks present ..... *güntheri*, 15

dd. Second dorsal spine but very little longer than third, its anterior edge smooth or very weakly serrate; dorsal VIII–15; anal 15; scales 56; no dorsal blotch ..... *abyssalis*, 16

aa. Pectorals very long, reaching nearly to end of dorsal; dorsal VIII–15; anal 15; scales 55; no dorsal blotch ..... *japonica*, 17

13. LEPIDOTRIGLA ALATA (Houttuyn).

KANAGASHIRA, Metal Head.

Trigla alata HOUTTUYN, Verhandl. Hollandsch. Maatsch. Weetensch., Haarlem, XX, Deel 2, 1782, p. 320 (ca.), (Nagasaki).

Trigla bürgeri TEMMINCK and SCHLEGEL, Faun. Japon., Pisc., p. 35, pl. XIV, figs. 1 and 2 (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 218 (coasts of China and Japan).—GÜNTHER, Cat. Fishes, II, 1860, p. 198 (Japanese and Chinese seas).—BLEEKER, Niewe Nalez. Ichth. Japan, 1857, p. 73 (Nagasaki); Enum. Poiss. du Japon, 1879, p. 13 (Nagasaki; Shimoda).—NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, No. 4, 1887, p. 21 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Fische Japan's, 1887, IV, p. 261 (Tokyo; Nagasaki).—ISHIKAWA, Cat. Fishes Imp. Mus. Tokyo, 1897, p. 47 (Nagasaki).

Lepidotrigla alata JORDAN and STARKS, Bull. U. S. Fish Comm., XXII, 1902, p. 596 (shores of southern Japan).

Habitat.—South Japan, and north to Tokyo; China.

Head 3.2 to 3.5; depth 4 to 4.3; D. IX–16 or 17; A. 16; scales 63; eye 3.2 to 3.3; snout 2.1 to 2.2; maxillary 2.5; interorbital space 3 to 3.25; second dorsal spine 1.8 to 2; pectoral 1; ventral 1.2.

Snout with two long, pointed, divergent processes, the distance between their apices nearly or quite twice the diameter of the pupil, and the depth of the emargination equal to or greater than the width of the pupil; interorbital space concave; pre- and postocular spines obsolete; an extremely small postocular cross groove; nuchal spine short; opercular spine barely crossing gill-opening, humeral spine quite long and sharp, reaching the vertical from the sixth dorsal spine; second and third dorsal spines subequal, both shorter than in other Japanese *Lepidotriglæ*; pectoral reaching vertical from third ray of soft dorsal; upper pectoral appendage reaching about to tip of ventral; dorsal scutes rather small, ending in sharp points.

Color in life clear red, with pale edgings; "brick red * * *; belly, anal, and membranes of ventrals whitish; pectorals greenish yellow with reddish borders." (Schlegel.) "Pectorals for the most

part milk-white externally, inside dusky violet with the exception of the upper and the three undermost rays, which show a yellow shade." (Steindachner.)

This abundant species is readily recognized by its long, diverging nasal prominences, and short spinous dorsal.

(*alata*, winged.)

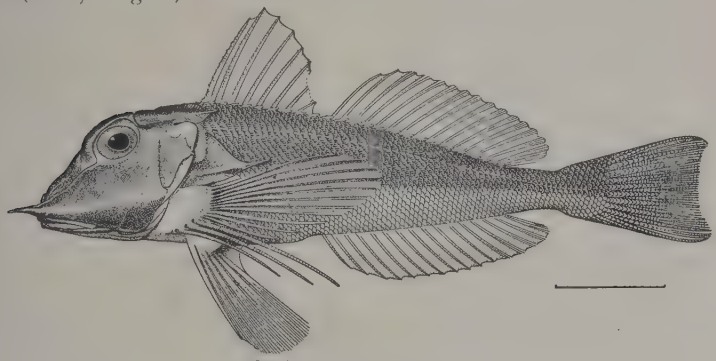

FIG. 7.—LEPIDOTRIGLA ALATA.

In the Museum of Stanford University are specimens as follows: Nagasaki, 40 specimens, 3 to 8 inches; Wakanoura, 18 specimens, 3 to 4½ inches; Misaki, 1 specimen, 3¾ inches; Kobe, 5 specimens, 2½ to 3½ inches; Tsushima, 1 specimen, 3 inches. It was also seen at Tsuruga and Onomichi.

The above description is based on 2 specimens, 6 and 6½ inches long, from Nagasaki.

14. LEPIDOTRIGLA MICROPTERA Günther.

Lepidotrigla microptera GÜNTHER, Ann. and Mag. Nat. Hist., 1873, p. 241 (Shanghai).—GÜNTHER, Shore Fishes Challenger, 1879, p. 67 (Inland Sea of Japan).—NAMIYE, Class. Cat., 1881, p. 101 (Tokyo).—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's (IV), 1887, p. 263 (Tokyo; Hakodate; Shanghai).—JORDAN and STARKS, Bull. U. S. Fish Com., XXII, 1902, p. 595 (localities at conclusion of present description).

Lepidotrigla strauchi STEINDACHNER, Ich. Beitr., V, 1876, p. 166 (Hakodate).

Lepidotrigla serridens HILGENDORF, Ges. Naturf. Freunde, 1879, p. 107 (Tokyo).—NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, No. 4, 1887, p. 21 (Nagasaki).

Lepidotrigla smithii REGAN, Ann. and Mag. Nat. Hist. (7), XV, 1905, p. 22, (Inland Sea of Japan).

Habitat.—Japan, north to Hakodate; China.

Head 3.4; depth 4.5 D.[a] VIII or IX, 15 to 17; A.[b] 15 to 17; scales[c] more than 60 (as a rule about 65); eye 3.5; snout 2.25;

[a] Of 15 specimens examined (various localities), three had VIII–15, five VIII–16, two VIII–17, one IX–16, three IX–17, and one IX–18.

[b] A. 17, Günther; 16–18, Steindachner; 14, Regan (young specimens). Of 14 examined, three (young) had A. 15, five 16, and six 17.

[c] Lat. line 75, Günther; 65–66 (adults), 59–60 (young), Steindachner; 58–63, Regan (young).

maxillary 2.3 to 2.6; interorbital space 3.4 to 3.6; second dorsal spine 1.4; pectoral 1; ventral 1.2.

Snout moderately emarginate, the lateral prominences short and sharp, consisting typically of a single spine on each side, or (in adults) of a single prominence (or two) longer than the rest; preocular spines very small, nearly obsolete; nuchal spine reaching past base of second dorsal spine; opercular spine extending on anterior fifth of base of humeral spine; humeral spine long and sharp, reaching nearly to base of fifth dorsal spine; second dorsal spine but little (about one-eighth) longer than third and very weakly serrated, being as a rule smooth for the outer fourth of its anterior edge; pectoral to vertical from fifth ray of soft dorsal; upper detached pectoral ray short, missing the tip of the ventral by a distance about equal to diameter of eye; dorsal scutes moderately developed, their spines short and not very sharp.

Life color, bright brick red above, the belly abruptly white, the junction marked by a silver line; fins red, or with some creamy white; a black blotch on the spinous dorsal between the fourth and seventh spines; no blue. In preserved material the dorsal blotch shows most plainly in young specimens (under 4 inches). In adults it is sometimes almost wholly wanting.[a]

This species differs plainly from both *L. güntheri* and *L. abyssalis* in its shorter detached pectoral rays and in the presence of the (usually) prominent dark blotch between fourth and seventh spines of first dorsal. There appears to be no doubt that *L. smithii* Regan is the young of this species. Young specimens in our collections from Nagasaki and Wakanoura have D. VIII–15 and A. 15. In one of these the first (rudimentary) anal ray is but three-eighths of the second, and the second only two-thirds of the third. Regan's figure shows the first spine fully five-sixths of the second, a condition we have not observed in any specimen. As his specimens were all small (7 to 9 cm.) it seems not impossible that he may have overlooked a rudimentary spine. The dark longitudinal bar on the soft dorsal, described by Regan, is a characteristic of young specimens, appearing in two young individuals 4½ inches long in our collection from Aomori.

(*μικρός*, small; *πτερόν*, wing, i. e., fin).

Specimens in the Stanford University Museum are from localities as follows: Tokyo, 3 specimens, 6½ to 8 inches; Hakodate, 6 specimens, 3½ to 7½ inches; Kobe, 3 specimens, 3 to 4 inches; Wakanoura, 1 specimen, 3 inches; Nagasaki, 21 specimens, 3 to 4 inches; Aomori, 13 specimens, 3 to 7½ inches; Hiroshima, 1 specimen, 3 inches; Tsuruga, 115 specimens, 2 to 3½ inches; Matsushima Bay, station 3770, in 42 to 45 fathoms, 1 specimen, 8½ inches; Suruga

[a] Steindachner says that the spot was wanting in adult specimens described by him as *L. strauchii*.

Bay, station 3715, off Ose Point, in 64 to 65 fathoms, 1 specimen, 5 inches.

This is the commonest species of the genus in Japan, except about Nagasaki, where *Lepidotrigla alata* is more abundant. It extends its range well to the northward. It is commonest about the shores, although running also into deeper water.

The above description is based on two specimens, 7½ and 8 inches long, taken at Aomori and Tokyo.

15. LEPIDOTRIGLA GÜNTHERI Hilgendorf.

Lepidotrigla güntheri HILGENDORF, Ges. Naturf. Freunde, 1879, p. 106 (Tokyo).—JORDAN and STARKS, Bull. U. S. Fish Com., XXII, 1902, p. 594. (Localities given below.)

Lepidotrigla longipinnis STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's, 1887, IV, p. 262, pl. IV, fig. 1 (Tokyo).

Habitat.—Japan, north to Tokyo.

Head, 3.25; depth, 4.4 to 4.6; D. VIII–15 or 16; A. 15 or 16; scales, 56–58; eye, 3 (young) to 3.4; snout, 2.2; maxillary, 2.4; interorbital space, 3.8 to 4; second dorsal spine, 1.25 (young) to 1.5; pectoral, 1.2; ventral, 1.3.

Snout moderately emarginate, the lateral prominences rather broad and unevenly serrated; interorbital space quite concave in young, in adults the excavation forming a broad, almost flat-bottomed groove; two small preocular spines; a low post ocular spine with a cross furrow behind it; nuchal spine reaching to base of second dorsal spine, its inner edge rather strongly serrate; opercular spine reaching but little past opercular opening, humeral spine sharp, reaching past fourth dorsal spine; pectoral reaching to vertical from base of fourth soft dorsal ray; upper detached pectoral ray extending nearly to tip of ventral; dorsal scutes strong, with long and sharp spines, these becoming increasingly sharp posteriorly.

Color brown, with 3 brown cross shades, one under each dorsal and one at base of caudal, these becoming fainter with age; young with a blackish bar at tip of caudal; pectoral black within; back mottled; no black dorsal spot, but sometimes a dusky cross shade on dorsal; no sharp line on side bounding the pale color of belly.

This species is readily distinguished from *L. microptera* by its different coloration, by its long, saw-edged second dorsal spine, better developed cephalic armature, longer and sharper dorsal scutes, and longer pectoral appendages. For the differences between it and *L. abyssalis* see the description of that species.

(Named for Dr. Albert Günther.)

We have examined specimens from the following localities: Northwest Pacific, station 5070, Suruga Bay (*Albatross*, 1906), 108 fathoms, 1 specimen, 3 inches; Northwest Pacific, station 4876, Tsushima Strait (*Albatross*, 1906), 59 fathoms, 9 specimens, 1½ to 4½ inches;

Tokyo, 1 specimen, 8 inches; Suruga Bay, off Ose Point, several specimens, under 5 inches, taken in depths of from 60 to 500 fathoms; Totomi Bay, station 3727, under 5 inches; Yokohama, market, 1 specimen, nearly a foot in length.

Measurements used in above description made on two specimens 8 and 5 inches long, taken at Tokyo and in Suruga Bay.

16. LEPIDOTRIGLA ABSYSSALIS Jordan and Starks.

Lepidotrigla japonica Nyström, Svensk. Vet.-Akad. Handl., 13, IV, No. 4, 1887, p. 23 (Nagasaki). (Name preoccupied.)

Lepidotrigla abyssalis Jordan and Starks, Bull. U. S. Fish Com., XXII, 1902, p. 595, fig. (Suruga Bay).

Habitat.—Japan, north to Tokyo, in rather deep water.

Head 3; depth 4.2; D.VIII–15; A.15; scales 56; eye 3.16 in head; snout 2.5; maxillary 2.75; interorbital space 4; first dorsal spine 2.1; second dorsal spine 1.75; pectoral 1.1; ventral 1.25.

Snout almost truncate at tip, a sharp spine slightly projecting at each angle; interorbital space rather deeply concave; a short narrow cross furrow above posterior margin of eye, as in *L. güntheri;* nuchal spines and ridges little developed; humeral spine moderately strong, reaching vertical from third dorsal spine; second dorsal spine somewhat longer than third, but more slender and much less elevated than in *L. guntheri;* upper detached pectoral ray reaching tip of ventral, which reaches to base of second anal ray, pectoral reaching to vertical from base of fifth ray of soft dorsal.

Color mottled red; pectoral bluish black, other fins without markings; no traces of a spot on spinous dorsal.

In its long pectoral appendages, postorbital furrow, and plain colored spinous dorsal this species resembles *L. güntheri.* From that species it differs, however, in its more slender dorsal spines and shorter second spine, which is also not strongly serrated.

(ἄβυσσος, an abyss; in allusion to the deep water habitat of this species.)

We have examined specimens from the following localities: Station 4904, *Albatross,* 1906, 107 fathoms. One specimen, 4 inches (head not as smooth as in type of *L. abyssalis;* otherwise identical); Suruga Bay, station 5713, 50 to 60 fathoms, one specimen, $3\frac{1}{8}$ inches.

The above description is condensed from the original description by Jordan and Starks, who first described it from Cat. No. 51440, U.S.N.M. This is apparently the species named *japonica* by Nyström, but there was already a *japonica* in this genus.

17. LEPIDOTRIGLA JAPONICA (Bleeker).

Prionotus japonicus Bleeker, Niewe Nalez. Ichth. Japan, 1857, p. 75, pl. v, fig. 1 (Japan).—Günther, Cat. II, 1860, p. 196.

Lepidotrigla japonica Steindachner and Döderlein, Fische Japans, 1887, IV, p. 264 (Oshima; Kagoshima).—Jordan and Starks, Bull. U. S. Fish. Com., XXII, 1902, p. 596, fig.; (Misaki). (Not of Nyström).

Habitat.—South Japan, north to Tokyo.

Head 3.3; depth 4.2; D.IX–15; A.14; scales 57; eye 3.25; snout 2.2; maxillary 2.3; interorbital space 3.75; first dorsal spine 1.4; second dorsal spine 1.5; pectoral 0.6; ventral 1.0.

Snout moderately emarginate, with a small secondary notch at center, the angles without spine-like prominences; interorbital space deeply concave; pre- and post- ocular spines little developed; a deep postocular groove on each side; nuchal spine nearly to base of third dorsal spine; opercular spine scarcely crossing gill opening; humeral spine reaching past vertical from fourth dorsal spine; pectorals very long, reaching to the eleventh or twelfth ray of soft dorsal; ventrals past fourth anal ray; pectoral appendages short, the upper one missing tip of ventral by a distance nearly equal to diameter of eye; dorsal scutes moderately developed, with broad, flattish (not spine-like) points.

Preserved specimens show a rather sharp line separating the upper (darker) part of side from the lower silvery portion; spinous dorsal with a diffused blotch between the fourth and seventh spines, and with more or less dusky shade forward, especially near margin of fin; soft dorsal with cross rows of faint dusky spots; pectoral black inside, with scattered lighter spots; pectoral appendages with some dark pigment midway of their length.

(*japonicus*, Japanese.)

The long pectoral fins of this species separate it unmistakably from the other species of *Lepidotrigla* found in Japan.

Specimens have been examined from the following localities: Nagasaki, market, 1 specimen, 4 inches (1906); Misaki, 1 specimen, 4½ inches; Wakanoura, 4 specimens, 3 to 4 inches.

The above measurements were made on a Misaki specimen, 4½ inches.

9. CHELIDONICHTHYS Kaup.

Chelidonichthys Kaup, Archiv. f. Naturgeschichte 1873, p. 87 (*hirundo*).

Scales small, no long shields along lateral line.

Each dorsal fin with a series of spine-tipped shields along its base; opercular spine small; dorsal rays IX–16; anal 15; anal spine wanting. This genus, like the next (*Otohime*) differs markedly from *Lepidotrigla* in the smaller scales. From the closely related European genus, *Trigla*, this genus differs in the unarmed lateral line. The American genus, *Prionotus*, has palatine teeth, these being wanting in the old-world gurnards. Characters otherwise those of the family.

The numerous species abound on the coasts of Europe, Africa, and India; ranging north to Japan.

(χελιδών, swallow; ἰχθύς, fish.)

18. CHELIDONICHTHYS KUMU (Lesson and Garnot.)

HOKO (Sword), KUROHOBO (Black Gurnard).

Trigla kumu LESSON and GARNOT, Voy. Coquille, Poiss., 1830, p. 214, pl. XIX (New Zealand, "le grande Baie des Iles").—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 50 (advance printing of description of Lesson and Garnot).—JENYNS, Zool. Beagle, Fishes, 1842, p. 27 (New Zealand; Bay of Islands).—TEMMINCK and SCHLEGEL, Faun. Japon. Pisc., 1843, p. 37, pl. XIV (seas of Japan).—BLEEKER, Niewe Nalez. Ichth. Japan. 1857, p. 74 (Nagasaki).—GÜNTHER, Cat. Fishes, II, 1860, p. 204 (New Zealand to coast of China).—NAMIYE, Class. Cat., 1881, p. 101 (Tokyo).—MACLEAY, Cat. Austral. Fishes, I, 1881, p. 225 (Port Jackson).—NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, No. 4, 1887, p. 21 (Nagasaki).—STEINDACHNER and DÖDERLEIN, Beitr. Kennt. Fische Japan's, 1887, IV, p. 265 (no locality).—ISHIKAWA, Cat. Fishes Imp. Mus. (Tokyo), 1897, p. 47 (Tokyo).

Trigla spinosa MCCLELLAND, Calc. Journ. Nat. Hist., IV, p. 396, pl. XXII, fig. 2 (China).—RICHARDSON, Ichth. China and Japan, 1846, p. 218 (Chusan).

(?) *Trigla pictipinnis* KAUP, Archiv. für Naturgesch., 1873, p. 87 (Barbados) (locality erroneous).

Trigla kumu dorsomaculata STEINDACHNER, Ich. Beitr., V. p. 168, 1876 (Chi-fu).

Habitat.—Japan, north to Aomori; China; also from Australia and New Zealand, where it is one of the common food fishes.

Head, 3.3; depth, 5.25 to 5.60; D. IX–16; A. 15 or 16; eye, 4.5 to 4.6; interorbital[a] space, 5.8 to 6; snout, 2.2; maxillary, 2.3; second dorsal spine, 1.8; pectoral, 0.6 to 0.8; ventral, 1.2.

A full comparison of Japanese and Australian specimens is shown in the following table:

Dimensions.	Port Jackson, 5 to 8½ inches.	Misaki Sagami, 7½ inches.	Tokyo, 9 inches.
Head	3.50	3.30	3.25
Depth	5.00	5.25	5.60
Dorsal	IX–15	IX–16	IX–16
Anal	.15	.16	.15
Scales			
Eye	4.33	4.50	4.60
Interorbital space	7.10	6.00	5.80
Snout	2.25	2.16	2.20
Maxillary	2.20	2.30	2.30
Second dorsal spine	1.66	1.80	1.80
Pectoral	0.75	0.60	0.80
Ventral	1.16	1.16	1.20

Snout rather long, as a rule, with an evident emargination in front, the angles serrated and produced over the maxillaries a distance about equal to their width (toothed portion); interorbital space concave,

[a] Japanese and Australian specimens varied as follows in width of interorbital space: Six specimens, Tokyo: 5.80, 6.10, 6.20, 6.30, 6.30, 6.50 (5 to 8 inches); 2 specimens, Port Arthur: 6.3: 6.6 (8 inches); 2 specimens, Tsuruga: 6.2, 6.3 (5 inches); 1 specimen, Misaki: 6.3, 6.6 (7 inches); 1 specimen, Port Jackson: 7.10 (8½ inches); 1 specimen, Port Jackson: 7 (5 inches); 1 specimen, Port Jackson: 6.50 (6¼ inches).

rather wider than in specimens of *C. kumu* from Australia; two short but strong preocular spines, a low postocular spine, with a very shallow cross-furrow behind it; nuchal spine not reaching to front of dorsal; opercular spine barely crossing gill opening; humeral spine about to vertical from fourth dorsal spine; second and third dorsal spines subequal; posterior margin of spinous dorsal nearly straight; pectoral to tenth ray of soft dorsal; upper pectoral appendage missing tip of ventral by a distance equal to two-thirds diameter of eye; dorsal scutes moderate, their points not long and sharp.

Color in life olivaceous, the deep lustrous blue of the inner side of the pectoral fins very conspicuous; preserved specimens have the back (in adults) more or less coarsely mottled or blotched; a plain line separates the upper color from the paler whitish (silvery) of the belly; young specimens have the back crossed with three or four broad, obliquely disposed, and rather obscure cross-bands; spinous dorsal in adults with some dusky on outer margin; soft dorsal with its outer third dusky; caudal with a diffused dark blotch posteriorly; pectoral inky blue inside, with a narrow pale outer margin, and with its inner lower third, or entire lower half, darker in color than the rest of the fin and marked with from 6 to 20 light-colored spots.

(*kumu,* the native Maori name of this fish in New Zealand.)

We are unable to separate this common Japanese fish from the species *Kumu,* which is one of the best known food fishes of New Zealand and Australia.

Specimens of this species from Port Jackson (Sydney) differ from the Japanese form in having the snout less emarginate and its angles less produced, scarcely extending over the retracted maxillaries; in Port Jackson specimens the interorbital space is slightly narrower (7 to 7.10 in head) than in Japanese individuals; a single specimen from Sydney (6¼ inches long) has the interorbital space as broad as in some Japanese specimens (6.50 in head). The coloration of the pectoral fins varies in these specimens, the one just noted and the small one from Port Jackson having only 8 to 12 spots, gathered in a dark blotch on the lower inner third of the fin, as in the figure of Lesson; while the larger Port Jackson specimen has the spots 18 or 20 in number and scattered over the lower two-thirds of the fin. This amount of variation in the markings of Australian specimens would seem to break down the distinction between *kumu* and *spinosus* as made out by Günther (Cat., II, p. 204), following McClelland. If a separate species or subspecies (*spinosus*) is to be made of the Japanese-Chinese form it is evidently impossible to establish it in color markings. Nevertheless, we shall not be surprised if slight but permanent differences in form should be made out, in which case the Japanese species will stand as *Chelidonichthys spinosus.*

We have examined specimens from localities as follows: Kobe, 7 specimens, 4½ to 5½ inches; Tokyo, 15 specimens, 5 to 8½ inches; Tokyo, market, 6 specimens, 5 to 6 inches; Nagasaki, 4 specimens, 5 to 6 inches; Kagoshima, 1 specimen, 6 inches; Kawatana, 1 specimen, 5½ inches; Misaki, 2 specimens, 6 to 7 inches; Aomori, 29 specimens, 2 to 3 inches; Tsuruga, 6 specimens, 3½ to 5 inches.

Here described from two specimens, 7½ and 9 inches long, from Misaki and Tokyo, respectively. Jordan and Snyder observed specimens also at Wakanoura, Hakodate, and Matsushima.

10. OTOHIME Jordan and Starks.

Otohime JORDAN and STARKS, Proc. U. S. Nat. Mus., XXXII, 1907, p. 13, (*hemisticta.*)

Back with blunt shields along base of spinous dorsal; base of soft dorsal unarmed; opercular spine very long; dorsal rays VIII 10; anal 11; a distinct anal spine; scales small as in *Chelidonichthys*, with no transverse bony plates along lateral line; no palatine teeth, characters otherwise those of family.

(*Otohime*, a goddess of fishes, in Japanese folk-lore.)

19. OTOHIME HEMISTICTA (Temminck and Schlegel).

KANADO, Metal Fish.

Trigla hemisticta TEMMINCK and SCHLEGEL: Faun. Japon. Pisc., 1847, p. 36, pl. XIV, figs. 3 and 4; pl. XIV B (Nagasaki).—RICHARDSON, Ichth. China and Japan, 1846, p. 218 (Canton).—GÜNTHER, Cat. Fishes, II, 1860, p. 201 (after Schlegel).—NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, 1887, No. 4, p. 21 (Nagasaki).

Otohime hemisticta, JORDAN and STARKS, Proc. U. S. Nat. Mus., XXXII, 1907, p. 132, fig. (Misaki or Awa, outside bay of Tokyo).

Head (without opercular or rostral spines), 2.75; depth at occiput 4.50; eye 3 in head; maxillary 2; D.VIII–10; A.I,11; scales 105.

General form of body as in the species of *Chelidonichthys* and *Lepidotrigla*, the scales being very small, as in the former genus; opercular spine very long; fourth dorsal spine longest; pectoral reaching to opposite base of third anal ray; longest detached pectoral ray not reaching to tip of ventral.

Color, in alcohol, gray above, clouded or vaguely blotched and specked with dark; lower portion of sides and belly abruptly white; spinous dorsal with a large and well-defined dark spot between the fourth and sixth spines.

This species has very recently been fully redescribed by Messrs. Jordan and Starks on the basis of a specimen brought from Yokohama by Mr. Pierre Louis Jouy, and probably caught at Misaki or Awa, outside the bay of Tokyo. Its generic characters, together with the

above brief description, which is condensed from that of Jordan and Starks, are sufficient for its recognition.

(ἥμι, half; στικτός, speckled.)

A single specimen, from Misaki or Awa, 8 inches, Cat. No. 56432, U.S.N.M.

Family PERISTEDIIDÆ.

Body elongate, fusiform, covered with bony plates, each of which is armed with a strong spine; head bony; each preorbital produced into a long, flat process, which projects more or less beyond the mouth; mouth small, inferior, like that of a sturgeon; teeth none; lower jaw provided with barbels; gill membranes separate, narrowly joined to the isthmus anteriorly; gill rakers slender; dorsal fin continuous or divided; pectoral fin short, with the 2 lower-most rays detached; ventrals I, 5, separated by a broad, flat area; air bladder simple; pyloric caeca about 10; color generally red. Deep-sea fishes, bearing some resemblance to young sturgeons.

Two genera, with about a dozen species. Mediterranean, tropical Atlantic, East Indian, and Chinese and Japanese seas. One genus and 3 species known from Japan.

11. PERISTEDION Lacépède.

Peristedion LACEPEDE, Hist. Nat. Poiss., III, 1802, p. 368 (*malarmat=cataphractum*).

Peristethus KAUP, Proc. Zool. Soc. Lond., 1859, p. 103 (*cataphractus*); amended spelling.

Barbels large, forming large fringed tufts at angles of mouth and on lower jaw; dorsal fins 2; characters otherwise included above.

(*Ιιερί*, around; *στηθίον*, diminutive of *στῆθος*, breast; the breast being mailed.)

Three species known from the waters of Japan.

KEY TO SPECIES.

a. No spine above muzzle or in middle of forehead; caudal peduncle with 2 series of plates underneath.

b. Dorsal VIII-20; anal 20; head narrow, its width 2.2 in its length; nasal processes 3.75 to 4.25 in head; longest barbel less than one-third of head; preopercular angle blunt, without spine; color reddish brown, the back with conspicuous blackish vermiculations; pectorals with 2 or 3 black cross bars; spinous dorsal edges with black.....*orientale*, 20

bb. Dorsal VI-20; anal 22; head broad, its width 3.25 in the length to base of caudal; nasal processes 6.5; short; longest barbel two-thirds of head; preopercular shield ending behind in a long spine; color brownish (probably red in life), without black spots or marblings; pectoral and spinous dorsal black. *amiscus*, 21

aa. A single spine in middle of forehead; under side of caudal peduncle with 4 series of plates; D.VI-19; A.17; head, back, and sides with small round dots; spines and rays of dorsals dotted with brown.....*rieffeli*, 22

20. PERISTEDION ORIENTALE Temminck and Schlegel.

KIHOBO (Yellow Gurnard), TSUNO KANAGASHIRA (Horned Metal-head).

Peristedion orientale TEMMINCK and SCHLEGEL, Faun. Japon. Pisc., 1843, p. 37, pl. XIV, figs. 5 and 6; pl. XIV A, figs. 1 and 2 (Nagasaki).—JORDAN and STARKS, Bull. U. S. Fish Comm., XXII, 1902, p. 593, fig. — (Suruga Bay).

Peristethus orientale KAUP, Proc. Zool. Soc. Lond., 1859, p. 105, pl. VIII, fig. 2.—GÜNTHER, Cat. Fishes, II, 1860, p. 219 (after Schlegel).—NAMIYE, Class. Cat., 1881, p. 101 (Tokyo).—ISHIKAWA, Cat. Fishes Imp. Mus. Tokyo, 1897, p. 47 (Tokyo; Ajiro).

Habitat.—Japan, north to Tokyo, in deep water.

Head 2.66 in length without caudal; depth 6.5; width of head 2.2 in its length; eye 4.8 to 5.2; interorbital space = eye; snout 1.66 in head; nasal processes 3.75 to 4.25 (adult); longest barbel 3.8; D. VIII–20; A. 20; pectoral 2.3 in head; ventral 2.16; plates in upper lateral series 34 or 35.

Body about as wide as the head anteriorly, rather long, gradually tapering; 4 rows of long scutes on each side, each ending in a spine; spines of ventral and dorsal row of scutes becoming gradually smaller backward, those of the ventral series obsolete on the last 10 or 12 scutes; head little wider than front of body; nasal processes always somewhat divergent, the distance between their tips sometimes nearly twice their distance apart at base, even when the opercles are completely closed; lower lateral rim of cephalic shield narrow, shelf-like, its margin nearly straight, except for slight serrations, from the base of the nasal process to the angle of the preopercle, which is rounded and wholly without projecting spine; opercle with a blunt spine, preceded by a low minutely serrated ridge; no spine in front of eye; two blunt postorbital points, and two short occipital spines, with blunt points; no spines on muzzle; each lower jaw with a branched, brush-like barbel at its outer angle, inside of and behind which are many shorter single barbels, in a tuft-like cluster; the branched barbel reaching half way to base of pectorals.

Spinous dorsal beginning immediately behind first (fused) pair of dorsal scutes; the depressed fin reaching to base of second ray of soft dorsal; anal inserted under third ray of soft dorsal and extending about one plate behind it; pectoral reaching to tip of spine of tenth upper lateral scute; longest free pectoral ray extending slightly beyond pectoral; ventrals barely reaching vent; caudal emarginate.

Body and head covered with vermiculations of dark brown; pectoral with 2 or 3 dark cross bars and a blotch on the upper base; a dark marginal streak of blackish on spinous dorsal; soft dorsal with 2 rows of dark dots, the upper row forming a more or less continuous submarginal streak on both rays and membranes; lower parts pale, yellowish.

(*orientalis*, eastern.)

Of this species we have examined specimens from localities as follows: Misaki, 1 specimen, 7 inches; Tokyo, 1 specimen, 7 inches, and 1 specimen, 2½ inches; off Tokyo Bay, 2 specimens, 7 inches; Station 3707, Suruga Bay, off Ose Point, 68 to 70 fathoms, 1 specimen, 8¾ inches, and 4 specimens, 4 to 6 inches; Station 3708, Suruga Bay, off Ose Point, 65 to 125 fathoms; Station 3715, Suruga Bay, off Ose Point, 64 to 65 fathoms, 2 specimens, 4 to 6 inches; Stations 3716 and 3717, Suruga Bay, off Ose Point, 65 to 125 fathoms; Station 5070, Suruga Bay (Albatross 1906), 1 specimen, 4½ inches.

Here described from measurements made on a specimen from Station 3707, Suruga Bay, 8¾ inches long, and 2 specimens, 7 inches long, from Tokyo and Misaki.

21. PERISTEDION AMISCUS Jordan and Starks.

Peristedion amiscus Jordan and Starks, Bull. U. S. Fish Comm., XXII, 1902, p. 593, pl. III, figs. 1 and 2 (Sagami Bay).

Habitat.—Japan (Sagami Bay), in deep water.

Head 2.5 in length to base of caudal; depth 5.5; width of head 3.25; eye 4.25; snout 1.83; nasal prominences 6.5; longest barbel 1.33; D. VI–20; A. 22; pectoral 1.83; ventral 2.5; plates 36.

Body fusiform, tapering, with 4 rows of bony scutes on either side, each ending in a hooked spine; ventral row with spines much smaller except anteriorly; along posterior part of anal the spine is very low but evident; lower lateral row beginning just anterior to tip of pectoral and ending at base of lower caudal rays; dorsal row beginning at nape just within the large parietal spine and ending at base of upper caudal rays.

Head very broad, depressed, and expanded around the edges; anterior processes much divergent and tapering, the distance between their tips twice the length of one process; lateral wing of cephalic shield with two blunt spines, 1 opposite anterior and 1 opposite posterior orbital margin; preopercle with a long spine, two-thirds length of eye, preceded by a sharp ridge and extending posteriorly to all other parts of the head; opercle with a small, short, sharp spine, preceded by a low, sharp ridge; a small spine over front of eye, over posterior part of it a high spine; a very high and sharp occipital spine, two-thirds diameter of eye; no spines above muzzle; lower jaw with many barbels, the outermost a long, branched, brush-like appendage over two-thirds the length of the head and reaching nearly to the vent.

Spinous dorsal beginning between second and third spines of dorsal series of plates; tips of dorsal spines when depressed reaching to base of second dorsal ray; anal extending posteriorly beyond soft dorsal, its origin opposite that of the latter; tip of pectoral reaching fifteenth

spine of upper lateral series of plates; ventrals reaching just past middle of vent; caudal concave, its length 2.75 in head.

Color brown, probably red in life, with no black spots or marblings except a spot behind eye and a few dark edgings on ridges of head; pectoral black, pale-edged below; spinous dorsal black; soft dorsal, caudal, and ventral mottled; a dusky shade below last rays of soft dorsal; outer barbels of mouth black on distal half. (After Jordan and Starks.)

One specimen, the type, Cat. No. 51428, U.S.N.M., from Station 3698, off Manazuru Point, Sagami Bay, in 153 fathoms.

(ἄμισκος, a diminutive of ἄμη, shovel.)

22. PERISTEDION RIEFFELI (Kaup).

Peristethus rieffeli KAUP, Proc. Zool. Soc. Lond., 1859, p. 106, pl. VIII, fig. 3 (Chinese insect boxes?).—GÜNTHER, Cat. Fishes, II, 1860, p. 219.

Peristedion rieffeli SMITH and POPE, Proc. U. S. Nat. Mus., XXXI, 1906, p. 488 (Urado, Uchinoura Bay, Kagoshima).

Habitat.—Southern Japan, Uchinoura Bay, Kagoshima, Urado, to China.

Head $2\frac{1}{3}$; D. VI–19; A. 17; lateral line 32; preorbital processes $2\frac{1}{3}$ in distance from their extremities to the anterior margin of orbit; a single spine in the middle of the forehead, a pair of obtuse ones above the posterior angle of the orbit, and another pair of larger ones on the posterior extremity of the occipital bones; anterior ventral plates irregularly shaped, longer than broad; lateral ridge of head (preopercle?) terminating posteriorly in a very long, flat spine; length of snout, without preorbital processes, equal to that of remainder of head; two pairs of barbels; lower side of tail with two additional series of plates, separated by the anal fin; pectoral reaching to fifth plate of dorsal series; ventral to third abdominal plate; very small round dots visible on the head, back, and sides; spines and rays of dorsal fins dotted with brown (condensed from description of Günther.)

This species should be readily distinguished from *Peristedion orientale* by the single spine on the upper surface of the snout (not shown in Kaup's figure, however), by the difference in color, and by the presence of the two additional series of plates below the base of the caudal fin.

We have no specimens of this rare species. Since the time of its original description by Kaup in 1859 no specimens came to the notice of ichthyologists until 1903, when Smith obtained a single specimen at Urado and found two others in the Commercial Museum at Kagoshima.

(Named by Kaup for "my true and excellent friend, De Rieffel."

Family CEPHALACANTHIDÆ.

THE FLYING GURNARDS.

Body elongate, subquadrangular, tapering behind; head very blunt, quadrangular, its surface almost entirely bony; nasals, preorbitals, suborbitals, and bones of top of head united into a shield; nuchal part of shield on each side produced backward in a bony ridge, ending in a strong spine, which reaches past front of dorsal; interocular space deeply concave; preorbitals forming a projecting roof above the jaws; preopercle produced in a very long rough spine; cheeks and opercles with small scales; opercle smaller than eye; gill openings narrow, vertical, separated by a very broad, scaly isthmus; pseudobranchiæ large; gill rakers minute; mouth small, lower jaw included; jaws with granular teeth; no teeth on vomer or palatines; scales bony, strongly keeled; 2 serrated, knife-like appendages at base of tail; first dorsal of 4 or 5 rather high flexible spines, in some forms preceded by 1 or more free spines; an immovable spine between the dorsals; anal and second dorsal short, of slender rays; caudal small, lunate; pectoral fins divided nearly to the base, into 2 parts, the anterior portion about as long as the head, of about 6 rays, closely connected; the posterior and larger portion more than twice length of head, reaching nearly to caudal in the adult; much shorter in the young; these rays very slender, simple, wide apart at tip; ventral rays I, 4, the long fins pointed, their bases close together, the inner rays shortest; air bladder with 2 lateral parts, each with a large muscle; pyloric caeca numerous; vertebræ 9+13=22; myodome undeveloped, the cranial cavity mostly closed in front by expansions from the subtectals, suturally connected with corresponding expansions of the prootics and the parasphenoid; prosethmoid and anteal entirely disconnected, leaving a capacious rostral chamber opening backward mesially into the interorbital region; infraorbital chain with its second and third bones crowded out of the orbital margin by junction of the first and fourth, and leaving a wide interval between the suborbitals and preoperculum; the first very long and extending backward, the second under the fourth, and the third developed as a small special bone (pontinal) bridging the interval between the second suborbital and the antero-interior angle of the preoperculum; post-temporal suturally connected with the posterior bones of the cranium, and with the upper surface forming a large part of the roof of the head; intermaxillaries with well-developed ascending pedicles gliding into the cavity between the anteal and prosethmoids; postero-temporal distant from the proscapula, and manifest as an ossicle on the edge of the post-temporal.

Warm seas, in both oceans; 4 genera and 4 species known from the waters of Japan.

A KEY TO GENERA [a] OF FAMILY CEPHALACANTHIDÆ.

a. Lateral line wanting.
  b. Occiput without elongate ray-like free spine; continuous spinous dorsal preceded by two semi-paired rays, which fold backward on either side of the fin. *Cephalacanthus* (Atlantic species)
  bb. Occiput with an elongate ray-like free spine.
    c. A detached finlet of one spine, between elongate spine at occiput and the spinous dorsal proper.....*Dactyloptena*, 12
    cc. No detached finlet in front of spinous dorsal and behind occipital spine. *Daicocus*, 13
aa. Lateral line developed; occipital spine and detached dorsal finlet present. *Ebisinus* (Species East Indian)

[a] In view of the introduction of new generic distinctions in this paper, we here include reference to all the known genera and species of this interesting family.

CEPHALACANTHUS Lacepede.

Cephalacanthus LÁCÉPÈDE, Hist. Nat. Poiss, VI, 1802, p. 5 (*spinarella*=*volitans*).
Dactylopterus LÁCÉPÈDE, Hist. Nat. Poiss, VI, 1802, p. 8 (*pirapeda*=*volitans*).
Cephacandia RAFINESQUE, Anal. de Nat., 1815, p. 85 (substitute for *Cephalacanthus*).

Head with its upper surface and sides entirely bony; the scapular shield and the angle of the preoperculum produced backward as long spine-like processes; body covered with scales, those on the sides and back strongly keeled; lateral line absent; two dorsal fins, the first two rays of the spinous dorsal nearly detached and inserted pairedwise in front of the first true spine so that they may be folded backward one on each side of the fin; pectoral fins very long; no ray-like filament on occiput.

(κεφαλή head; ἄκανθα, a spine).

Atlantic and neighboring seas; one species known.

CEPHALACANTHUS VOLITANS (Linnæus).

Trigla volitans LINNÆUS, Syst. Nat., 10th ed., I, 1758, p. 296 ("Mari Mediterraneo Oceanio, Pelago inter tropicos, in Asia ad Cap. b. Spei").—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 138.
Gasterosteus spinarella LINNÆUS, Syst. Nat., 10th ed., X, Pt. 1, 1758, p. 297 ("habitat India" error in locality; should be Surinam. See Cuvier and Valenciennes, IV, p. 138).
Cephalacanthus spinarella LACÉPÈDE, Hist. Nat. Poiss., VI, 1802, p. 5.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 138, pl. LXXVII.—STEINDACHNER, Ichth. Span. u. Portugal, IV, 1867, pp. 91–92, pl. II, fig. 2; pl. IV, fig. 2.—LUTKEN, Spol. Atl., Fiske, 1880, pp. 417–428 and 590–591, pl. I, figs. 1–5
Dactylopterus pirapeda LACÉPÈDE, Hist. Nat. Poiss., VI, 1802, p. 8.
Dactylopterus volitans GÜNTHER, Cat. Fishes, II, 1860, p. 221.
Cephalacanthus volitans JORDAN and EVERMANN, Bull. U. S. Nat. Mus., No. 47, II, 1898, p. 2183, pl. CCCXXIII, fig. 778.

Atlantic Ocean and Mediterranean.

EBISINUS Jordan and Richardson, new genus.

Ebisinus JORDAN and RICHARDSON, new genus of *Cephalacanthidæ* (*cheirophthalmus*).

This genus differs from *Cephalacanthus*, *Dactyloptena*, and *Daicocus* in the presence of a well-developed lateral line. The spinous dorsal is preceded by a single detached

12. DACTYLOPTENA Jordan and Richardson, new genus.

This genus differs from *Cephalacanthus* [a] in having the spinous dorsal fin preceded by a detached finlet, consisting of one spine and a fully developed posterior membrane. With that genus and with *Daicocus* it agrees in possessing no lateral line. A long ray-like filament behind the occiput. Characters otherwise those of the family.

(δάκτυλος, finger; πτενός, winged.)

Japan, Hawaii, and the East Indies; a single species known.

Type of genus.—*Dactyloptena orientalis.*

spine and there is a long occipital ray as in *Dactyloptena*, to which the present genus seems most nearly related.

(*Ebisu*, the Japanese fish-god, god of the fish markets, from *Ebisu* a barbarian or foreigner.)

East Indies and Philippines; a single species known; a second (as yet undescribed) taken by Gilbert and Snyder at Nagasaki.

EBISINUS CHEIROPHTHALMUS (Bleeker).

Dactylopterus cheirophthalmus Bleeker, Nat. Tyds. Ned. Ind., VII, Oct. 1854, p. 494 (Banda Neira).

Dactylopterus macracanthus Bleeker, Bijdr. Ichth. Celebes, VI, Nov. 1854, p. 449 (Macassar in mari.—Günther, Cat, Fishes, II, 1860, p. 223 (Molucca Sea) (after Bleeker).

Fig. 8.—Ebisinus cheirophthalmus.

Dactylopterus cheirophthalmus Günther, Cat. Fishes, II, 1860, p. 223 (Sea of Banda Neira) (after Bleeker). (Amended spelling).

Cephalacanthus macracanthus, Jordan and Seale, Bull. U. S. Fish Comm., XXVI, 1906, p. 40 (Manila, Cavite, Panay).

Molucca and Philippine Seas.

[a] Characters of the genus to be found in footnote to key to genera of family Cephalacanthidæ, preceding.

23. DACTYLOPTENA ORIENTALIS (Cuvier and Valenciennes.)

SEMIHOBO (Cicada Square-head, or Gurnard.)

Dactylopterus orientalis CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 134, pl. LXXVI (Indian Ocean).—TEMMINCK and SCHLEGEL, Faun. Japon. Pisc., 1843, p. 37, pl. XVA (seas of Japan and China).—RICHARDSON, Ichth. China and Japan, 1848, p. 218 (Japanese and Chinese seas).—GÜNTHER, Cat. Fishes, II, 1860, p. 222 (China; Japan; Amboyna; Cape seas).—Shore Fishes Challenger, 1880, p. 42 (Arafura Sea).—NAMIYE, Class. Cat., 1881, p. 101 (Tokyo).—ISHIKAWA, Cat. Fishes Imp. Mus. Tokyo, 1897, p. 47 (Kagoshima).

Dactylopterus japonicus BLEEKER, Nat. Tyds. Ned. Ind., VII, 1854, p. 396 (Waka, Japan).—Niewe Nalez. Ichth. Japan, 1857, p. 72 (Nagasaki, in mari).

Cephalacanthus orientalis JORDAN and EVERMANN, Bull. U. S. Fish Comm., XXIII, 1905, Pt. I, p. 473, fig. 208 (Hawaiian Islands).

Habitat.—South Japan, East Indies, and Hawaii.

Head, 4.10 in length; depth, 5.50; snout, 2.75 in head; eye, 3,33; maxillary, 2.25; interorbital space, 2; D. I–I, V, 1–8; A., 7; P., 33; V. 5; scales, 47 in longitudinal and 21 in transverse series to edge of belly.

Body elongate, depressed, the lower surface flattened, head broad, depressed, squarish in cross section; interorbital space concave, its depth at middle equal to the width of the pupil; eye slightly nearer to end of snout than to upper corner of gill opening; side of head above produced backward in a long bony shield, ending in a keeled point opposite the base of the second spine of the continuous spinous dorsal; the distance between the apices of the scapular processes contained about 1⅓ times in the depth of the notch between them, which forms an acute angle; preopercle with a backwardly directed spinous process, whose tip reaches barely to base of ventrals in adults, but is somewhat longer in young; first (detached) spinous ray of dorsal fin originating just behind occiput, and greatly elongated, its tip reaching nearly to the back of the continuous spinous dorsal; second detached ray forming a spinous finlet with a well developed membrane, inserted directly in front of the continuous spinous dorsal, and of about half its height; spinous dorsal (the continuous fin) slightly higher than soft dorsal; a short keel-like spine in the space between the two fins; origin of anal about midway between base of caudal and gill-opening; caudal truncate; pectorals large and greatly elongated, their tips reaching past the base of the caudal and sometimes to its tip, the ends of the long median rays prolonged more or less as short filaments; caudal peduncle long and depressed, its length nearly equal to head; lower side of posterior part of trunk with 4 of the keel-like scales enlarged and movable, the first enlarged scale being opposite vent; base of caudal fin furnished with two pairs of movable keeled scales, one upper and one lower; lateral line wanting.

Color in alcohol dull purplish brown, with rather large dark round spots on the back of about size of pupil, and with lower surface whit-

ish; rays of spinous and soft dorsal and pectorals banded from the base outward with alternating pale and dusky; pectoral membranes blackish with irregular grayish spots; tips of pectoral rays whitish.

Color in life (Hawaii), drab above, white below; orange spots, smaller than pupil over top of head and back; caudal with 4 golden bands, pectoral covered with spots of dusky golden, larger posteriorly; a yellow band on upper part of spinous dorsal, curved with the concave side toward base; spinous dorsal with spots of dusky golden; soft dorsal transparent, with alive shades on rays; ventrals golden; anal transparent, golden-shaded.

(*orientalis*, eastern.)

We have examined specimens from localities as follows: Nagasaki, 9 specimens, 3 to 4 inches; Wakanoura, 4 specimens, 3 to 5 inches; Hawaii, 10 specimens. There seems to be no specific differences separating the latter from the Japanese form.

Described from 3 adult specimens, 8 to 10 inches long, taken at Hilo, Hawaiian Islands.

13. DAICOCUS Jordan and Richardson, new genus.

This genus agrees with *Cephalacanthus* and *Dactyloptena* in the absence of the lateral line, and with the last-named genus in possessing a long filamentous spine on the occiput. It differs from both of those genera in lacking a detached spine in front of the spinous dorsal. Characters otherwise those of the family.

Seas of Japan; one species.

(Named for Daikoku, the luck-god, the inseparable companion of Ebisu, the fish-god in Japanese folklore).

Type of genus.—Daicocus peterseni.

24. DAICOCUS PETERSENI (Nyström).

HOBO (Square-head.)

Dactylopterus peterseni NYSTRÖM, Svensk. Vet.-Akad. Handl., 13, IV, No. 4, p. 24 (Nagasaki).

Habitat.—South Japan, Misaki to Nagasaki.

Head 3.80 in length; depth 5; snout 2.60 in head; eye 3.60; maxillary 2.50; interorbital space 2; D. I–V–I–8; A. 6; P. 33; V. 5; scales 46–20.

Body elongate, depressed, belly flattened; head broad and depressed, squarish in section; interorbital space less concave than in *Dactyloptena orientalis*, the depth in middle being only about two-thirds width of pupil; eye almost exactly equidistant between tip of snout and upper corner of gill opening; distance between apices of scapular shields contained 1½ times in the depth of the notch between them, which is acute; tips of shields reaching to opposite second ray of spinous dorsal; preopercular process reaching scarcely past base

of ventrals; an elongated filament-like spinous ray on occiput, its tip reaching to the back of the continuous spinous dorsal; spinous dorsal not preceded by a short detached ray or finlet directly in front of its base; spinous and soft dorsals of about equal height, with a strong but short keel-like spine situated in the interval between them; origin of anal fin slightly nearer to base of caudal than to gill opening; caudal lunate; pectorals elongated, their tips reaching base of caudal; the long pectoral rays free at tip, somewhat filamentous; caudal peduncle as long as head, depressed, and broad and flat above anteriorly; 3 pairs of enlarged keeled scales along ventro-caudal edge, the first pair opposite middle of anal; base of caudal with an upper and lower pair of similar enlarged scales; no lateral line.

FIG. 9.—DAICOCUS PETERSENI.

Color in alcohol yellowish brown, the back and top of head with numerous roundish black spots, which are of smaller size than the spots of *Dactyloptena orientalis*; belly dirty white, the scales bearing considerable pigment in the form of fine punctulations; single rays of spinous and soft dorsal of alternating light and dark color from base to tip; pectoral membranes chiefly dark, but more or less streaked and spotted with whitish; the rays mostly pale, but blotched or banded at intervals with dusky. Life colors not recorded.

Here described from a single specimen 11 inches long, taken at Misaki.

(Named by Nyström for "J. V. Petersen i Japan.")

SUMMARY.

Family PLATYCEPHALIDÆ.

1. *Rogadius* Jordan and Richardson, 1908.

1. *asper* (Cuvier and Valenciennes), 1829.

2. *Thysanophrys* Ogilby, 1898.

§ *Insidiator* Jordan and Snyder, 1900.

2. *spinosus* (Temminck and Schlegel), 1843; Nagasaki.
3. *macrolepis* (Bleeker), 1857; Nagasaki.

§ *Grammoplites* Fowler, 1904.

4. *meerdervoortii* (Bleeker), 1860; Wakanoura; Shimizu.
5. *japonicus* (Tilesius), 1812; Tokyo; Misaki; Tsuruga; Wakanoura; Nagasaki.
6. *crocodilus* (Tilesius), 1812; Tokyo; Wakanoura; Onomichi; Hiroshima; Nagasaki.

3. *Platycephalus* Bloch, 1795.

7 *indicus* (Linnæus), 1758; Tokyo; Tsuruga; Wakanoura; Enoshima; Misaki; Nagasaki; Tsuruga; Kobe; Hiroshima; Onomichi.

Family BEMBRIDÆ.

4. *Bembras* Cuvier and Valenciennes, 1829.

8. *japonicus* Cuvier and Valenciennes, 1829; Boshu.

5. *Bambradon* Jordan and Richardson, 1908.

9. *lævis* Nyström, 1887.

6. *Parabembras* Bleeker, 1874.

10. *curtus* (Temminck and Schlegel), 1843.

Family HOPLICHTHYIDÆ.

7. *Hoplichthys* Cuvier and Valenciennes, 1829.

11. *langsdorfii* Cuvier and Valenciennes, 1829; Kagoshima.
12. *gilberti* Jordan and Richardson, 1908; Suruga Bay.

Family TRIGLIDÆ.

8. *Lepidotrigla* Günther, 1860.

13. *alata* (Houttuyn), 1782; Nagasaki; Wakanoura; Misaki; Kobe; Tsushima; Tsuruga; Onomichi.
14. *microptera* Günther, 1873; Hakodate; Aomori; Hiroshima; Tsuruga; Matsushima Bay; Suruga Bay; Kobe; Wakanoura; Tokyo; Nagasaki.
15. *güntheri* Hilgendorf, 1879; Tokyo; Suruga Bay; Totomi Bay; Yokohama.
16. *abyssalis* Jordan and Starks, 1902; Suruga Bay.
17. *japonica* (Bleeker), 1857; Nagasaki; Misaki; Wakanoura.

9. *Chelidonichthys* Kaup, 1873.

18. *kumu* (Lesson and Garnot), 1830; Aomori; Tsuruga; Misaki; Kawatana; Kagoshima; Nagasaki; Tokyo; Kobe.

10. *Otohime* Jordan and Starks, 1906.

19. *hemisticta* (Temminck and Schlegel), 1847; Misaki or Awa.

Family PERISTEDIIDÆ.

11. *Peristedion* Lacépède, 1802.

20. *orientale* Temminck and Schlegel, 1843; Misaki; Tokyo; Suruga Bay.
21. *amiscus* Jordan and Starks, 1902; Sagami Bay.
22. *rieffeli* (Kaup) 1859.

Family CEPHALACANTHIDÆ.

12. *Dactyloptena* Jordan and Richardson, 1908.

23. *orientalis* (Cuvier and Valenciennes), 1829; Nagasaki; Wakanoura.

13. *Daicocus* Jordan and Richardson, 1908.

24. *peterseni* (Nyström); Misaki.